June/1960

- *Automatic mixed-run hollow mold plant*
- *Report on Interpack Fair*
- *How to heat-seal polyethylene*

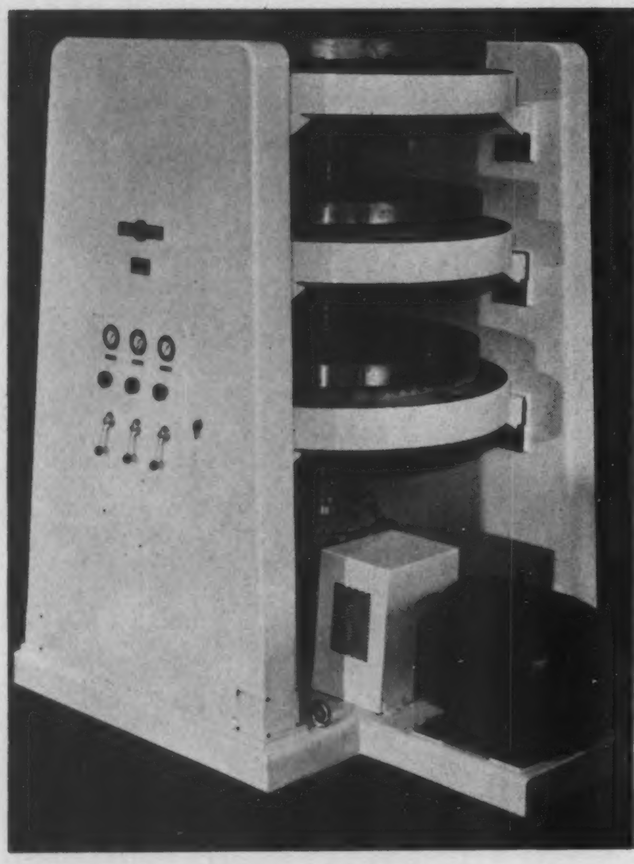
NCA Convention
Program—Exhibits

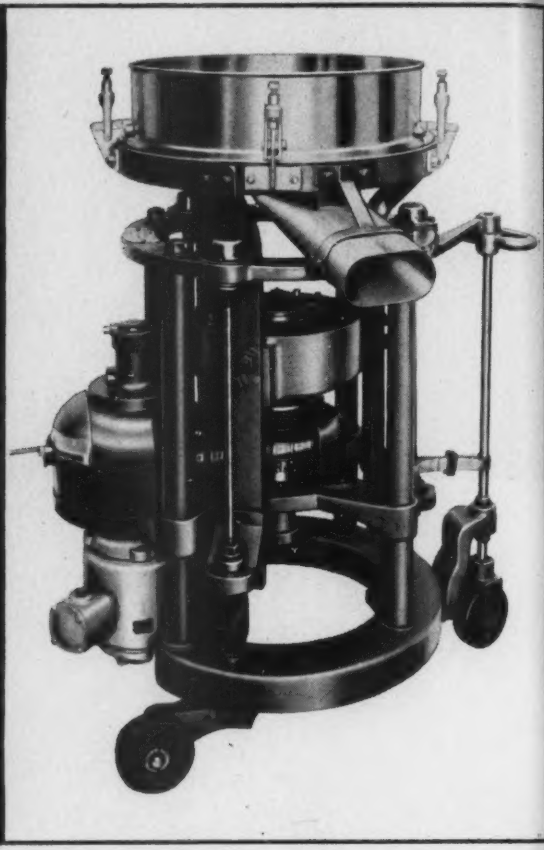
PMCA Production Conference
Cacao butter and fat bloom
Study of the consistency of marshmallow

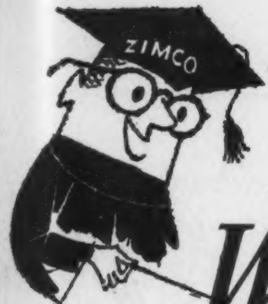
Vol. 40 #6

Manufacturing Confectioner

specialized publication for confectionery manufacturers



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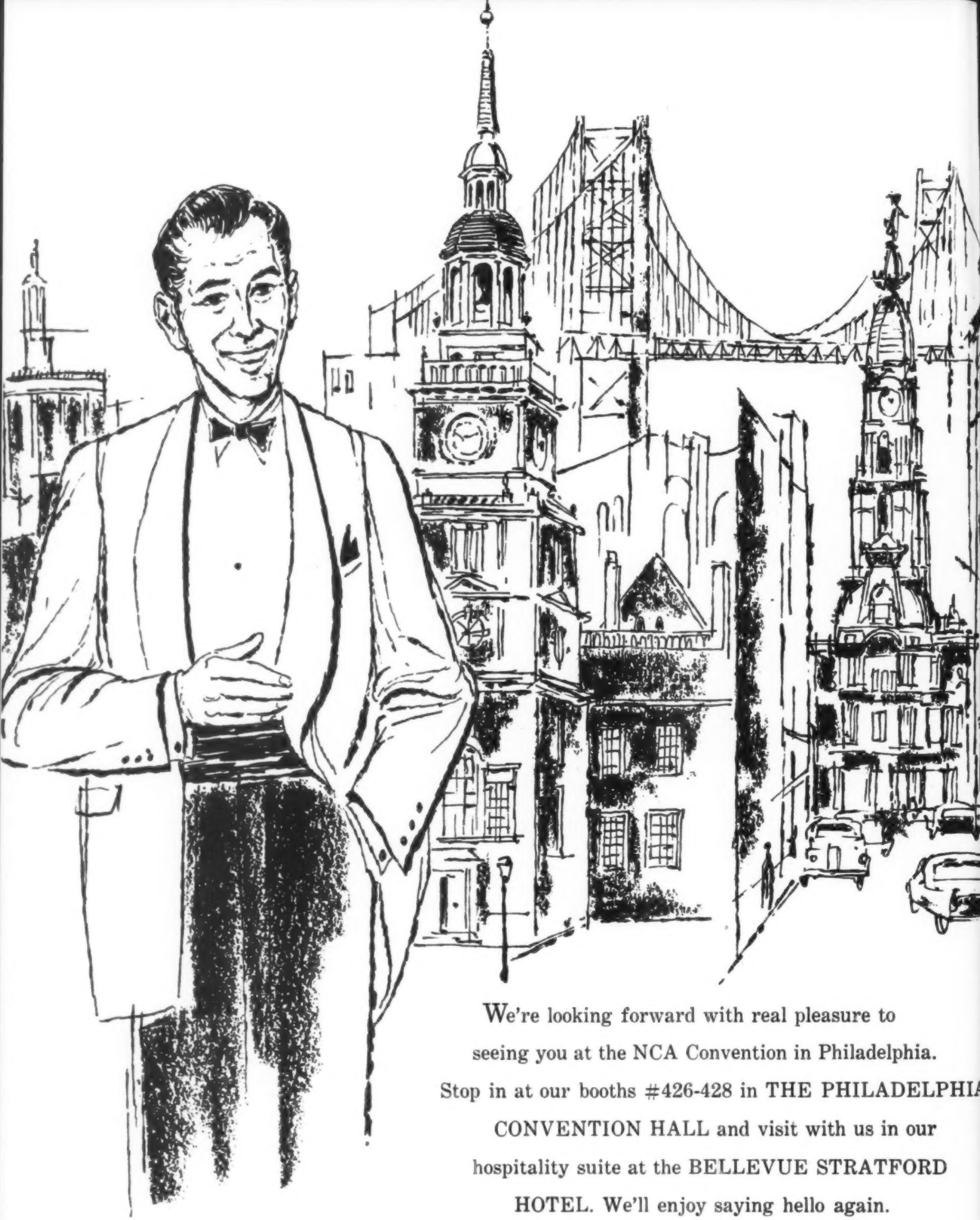

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candy business

Lipps named president of Curtiss

Charles V. Lipps has been named president of the Curtiss Candy Company. Prior to joining Curtiss in 1959, he was vice president in charge of sales for the food division of Beech-Nut Life Savers.

Scott to vice president of Curtiss

A. Charles Scott has been elected vice president of Curtiss Candy Company in charge of production. Prior to joining Curtiss last January, he was vice president in charge of production for Cherry Burrell Corporation.

Amplon Chocolate buys Abbott Candy

Amplon Chocolates Inc. of New York City, announces the acquisition of the Abbott Candy Co. of Edgewater, N. J. This will enable Amplon to service its customers with a comprehensive line of hollow goods. Mr. Samuel Shapiro, Sales Manager of Amplon, announced that in addition to the regular hollow moulded line, Amplon is introducing a high quality line of hollow moulded chocolates. Production of hollow goods will be under the supervision of Mr. Jerry Shapiro.

C. Rudolph Kroekel dies

C. Rudolph Kroekel, president of Kroekel-Oetinger, Inc., of Philadelphia, died May 23rd. Though he had been in poor health for some time, his death was quite sudden.

Mr. Kroekel had been active for many years in the activities of the Pennsylvania Manufacturing Confectioners Association, particularly in its Research Committee. He had also had a great deal to do with the development of the Production Conference of the PMCA to its present status of international recognition.

Philadelphia Gum elects

R. E. Werhane, sales manager of the Philadelphia Chewing Gum Company since 1955, has been named vice president in charge of sales. Robert Arnold, formerly district sales manager of Liggitt & Myers Tobacco Co., has been named eastern sales manager.

First quarter sales up 5%

The strong 5% increase for the first quarter of 1960, in comparison with the first quarter of 1959, is at least partially due to the later Easter holiday this year. It will not be until the figures for April are in that the true picture of sales trends can be determined.

Item	Estimated sales of current month and comparison: Mar. 1960 ($1,000)	Mar. 1960 from Mar. 1959	Estimated sales year to date: 3 months 1960 ($1,000)	Percent change from 3 months 1959
Confectionery and competitive chocolate products, estimated total...	104,890	+14	311,521	+5
BY KIND OF BUSINESS:				
Manufacturer-wholesalers	85,104	+22	251,015	+6
Manufacturer-retailers[1]	5,706	−42	18,126	−18
Chocolate manufacturers	14,080	+18	42,380	+12
TOTAL ESTIMATED SALES OF MANUFACTURER-WHOLESALERS BY DIVISION AND STATES				
New England	8,888	+10	28,275	+5
Middle Atlantic	25,817	+30	78,093	+7
N. Y. and N. J.	14,028	+15	40,858	+2
Pa.	11,789	+54	37,235	+12
East North Central	31,796	+25	91,854	+6
Ill.	27,817	+21	80,722	+4
Ohio and Ind.	2,891	+89	7,208	+63
Mich. and Wis.	1,088	+16	3,924	−5
West North Central	3,595	−2	10,538	([2])
Minn., Kan., S. Dak., and Neb.	2,191	−1	6,567	([2])
Iowa and Mo.	1,404	−3	3,971	([2])
South Atlantic	4,030	+14	11,470	+4
Md., D. of C., Va., W. Va., N. Car., and S. Car.	1,885	+22	5,244	+8
Ga. and Fla.	2,145	+7	6,226	+1
East South Central:				
Ky., Tenn., Ala., and Miss.	1,907	+10	5,237	−5
West South Central:				
Ark., La., Okla., and Tex.	2,917	+17	8,714	+8
Mountain:				
Ariz., Colo., Idaho, N. Mex., and Utah	953	+7	2,726	+2
Pacific	5,201	+21	14,108	+8
Calif.	4,270	+21	11,350	+8
Wash. and Ore.	931	+20	2,758	+8

[1]Retailers with two or more outlets.
[2]Less than 0.5 percent change.

Type of product[1]	March 1960: Pounds (1,000)	March 1960: Value ($1,000)	First 3 months Pounds (1,000): 1960	Pounds: Percent change from 1959	First 3 months Value ($1,000): 1960	Value: Percent change from 1959
TOTAL SALES OF SELECTED ESTABLISHMENTS	121,902	49,909	349,901	+1	147,239	+4
Package goods made to retail at:						
$1.00 or more per lb.	4,154	4,792	14,644	+13	17,873	+12
$.50 to $.99 per lb.	9,368	5,119	26,669	([3])	14,453	([3])
Less than $.50 per lb.	19,151	4,982	50,810	−2	13,298	−3
Bar goods	58,358	23,982	166,481	−1	69,578	+3
5¢ and 10¢ specialties	13,938	6,269	38,601	+3	17,455	+4
Bulk goods[2]	16,933	4,765	52,696	+9	14,582	+8

[1]Selected group of large manufacturer-wholesalers and chocolate manufacturers report sales by type of product. Companies reporting such detail account for approximately half of the total dollar sales of manufacturers.
[2]Includes penny goods.
[3]Less than 0.5 percent change.

Data from monthly "*Current Industrial Reports*" of the U. S. Department of Commerce.

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Candy promotion institute elects

Douglas Steinberg, president of the National Confectioners Association, has been elected chairman of the Steering Committee of newly formed Candy, Chocolate and Confectionery Institute. Thomas J. Sullivan, secretary-treasurer of the Associated Retail Confectioners of the U. S., has been elected treasurer. Other members of the four man steering committee are Bradshaw Mintener, executive director of the Chocolate Manufacturers Association, and C. M. McMillan, executive Secretary of the National Candy Wholesalers Association.

Mavrakos names sales manager

E. P. Dohrmann has been named sales and advertising manager of Mavrakos Candy Company of St. Louis. He has been associated with the firm as purchasing agent for fourteen years. B. S. Gaffney, formerly industrial relations manager, becomes purchasing agent.

A. J. O. Elmer dies

Alphonse J. O. Elmer, president of the Elmer Candy Company, died April 23rd.

Fruzola names Davidson sales manager

Glen E. Davidson has been named to the newly created post of director of marketing for the Fruzola Company. He has been associated with the Sheaffer Pen Company for twelve years.

Feind leaves Johnston Company

Robert L. Fiend has resigned as president of the Robert A. Johnston Company. He joined the firm as controller in 1952, and served as president for this past year. No president has yet been named, according to Walter V. Johnston, board chairman.

See's adds shops, reports profits

See's candy shops reported six months profits of $628,720. Sales for the period, ending Feb. 29, were $9,779,710, up almost one million. Six new shops are under construction in shopping centers, and they will bring the number of shops to 130.

John Raymond Williams dies

John Raymond Williams, vice president of Shupe-Williams Candy Company of Ogden, Utah, died April 12th.

Mandelbaum to purchase for Chunky

Harold A. Mandelbaum has been appointed director of purchases for Chunky Chocolate Corp. He was formerly purchasing director for Revlon.

Lucian Pierce joins Wilbur

Lucian E. Pierce has joined the Wilbur Chocolate Co. as assistant to the vice president, and will work on the development of industrial sales.

Jolly Rancher to expand

A twelve acre parcel of land, adjacent to the Jolly Rancher Candy Company, has been purchased by the firm, and at their request rezoned to industrial classification to allow future expansion of facilities.

Tom Conrad named by S. L. Kaye Co.

Tom Conrad, formerly sales manager of the Shotwell Manufacturing Company, has been named sales manager for chain variety stores for the S. L. Kaye Company.

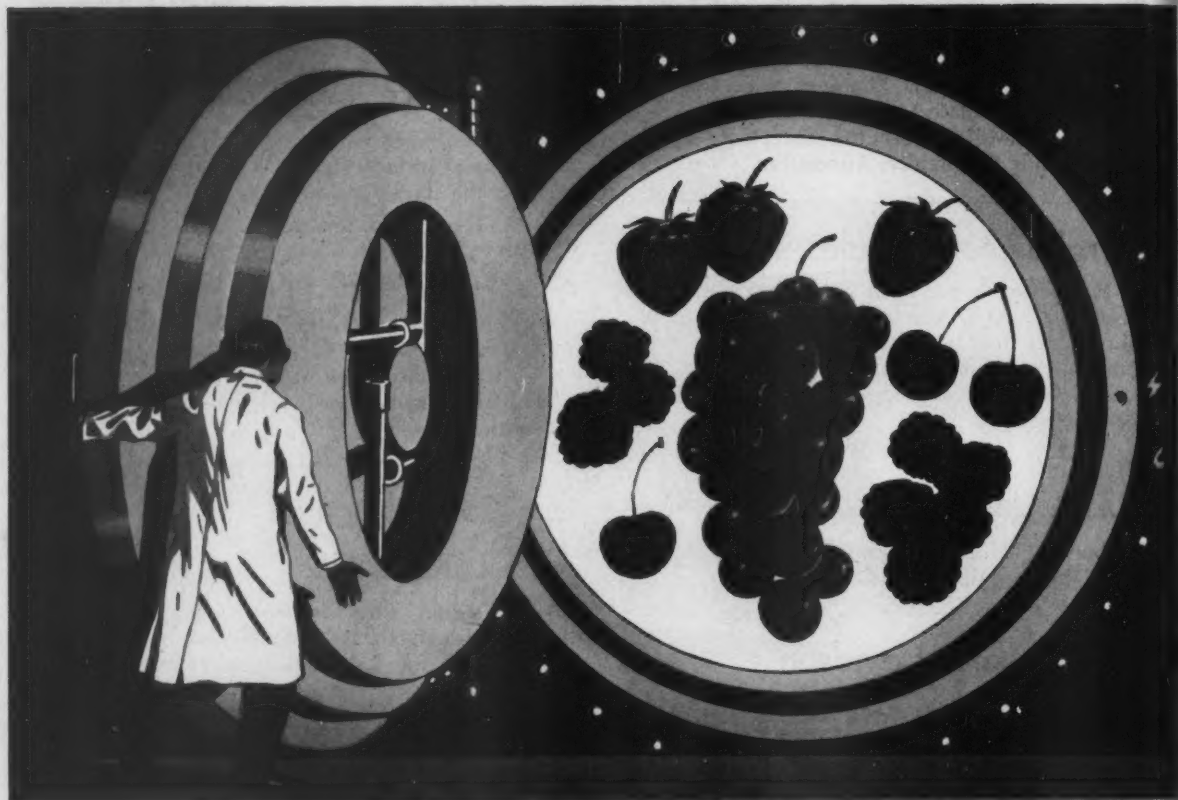
PMCA Conference Snaps

Shown here and other pages, are informal groups of top candy production men chatting between meetings of the production conference on the Franklin & Marshall campus in Lancaster, Pa. last month.

Production Conferees: Fred Wunder, Mars, Inc., and Jay Musser, Klein Chocolate.

Production Conferees: Col. Supplee, Frantz Candies, and Bob Minter, Minter Brothers.

The flavor is LOCKED-IN!



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FELCOFIX® LOCKED-IN Flavors are dry homogeneous powders that remain FRESH, TRUE and DELICIOUS even when used in mixtures containing acids, sugars and other reactive ingredients.

FELCOFIX® LOCKED-IN Flavors have truly amazing lasting power and their high concentration results in economies that are important to your profits.

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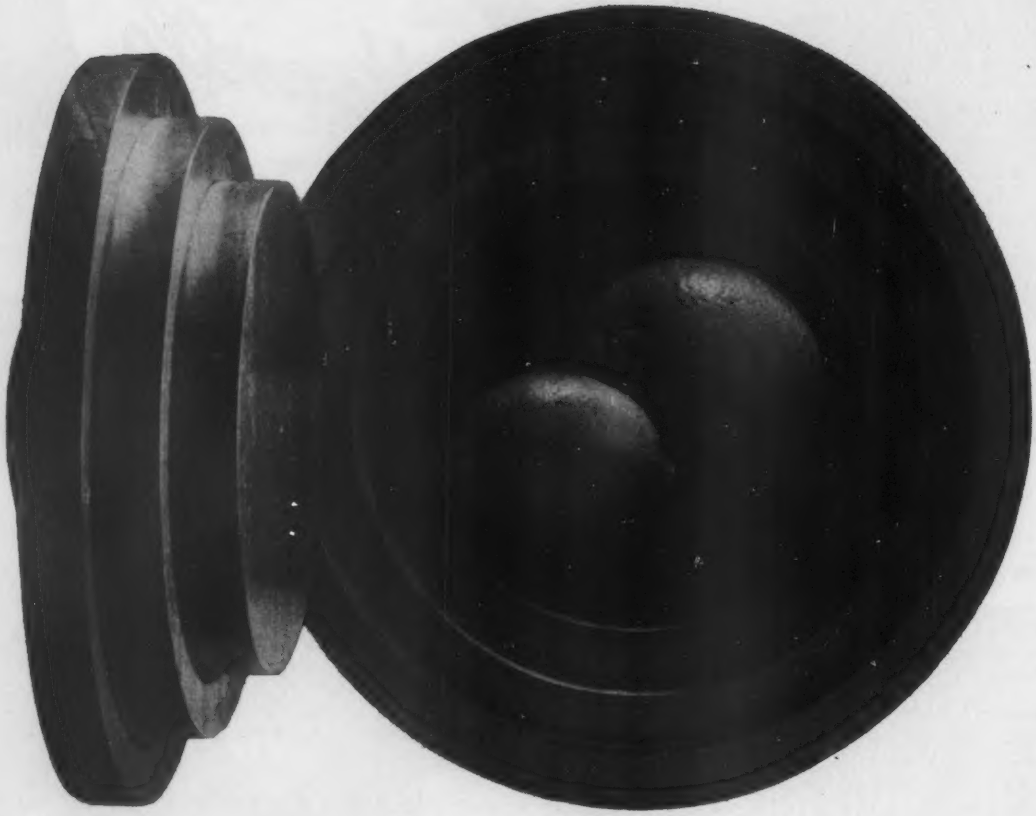

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Have you a "good" product you'd like to convert into a superior one? A processing problem? An idea for a new product that doesn't quite come off?

Call on Sunkist citrus research for help.

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All this "know how" is at your service. Sunkist technical men will be glad to work *with* you—in your own plant—or *for* you—in their own citrus research laboratory. Write, and a Sunkist man will call on you.

Sunkist Growers

PRODUCTS SALES DEPARTMENT

the Manufacturing Confectioner

with International Confectioner

Contents

June, 1960 — Volume XL—Number 6

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HIGH INITIAL GEL STRENGTH

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This new thin boiling starch is available in any physical form your process requires—in fluidities ranging from 40 to 70.

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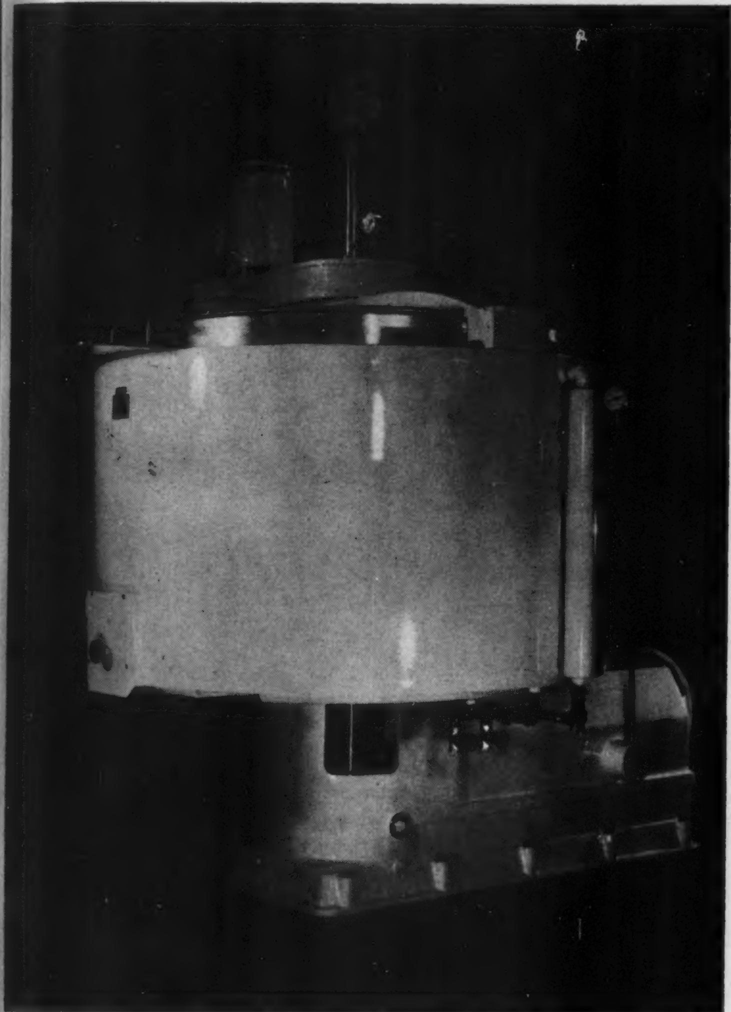

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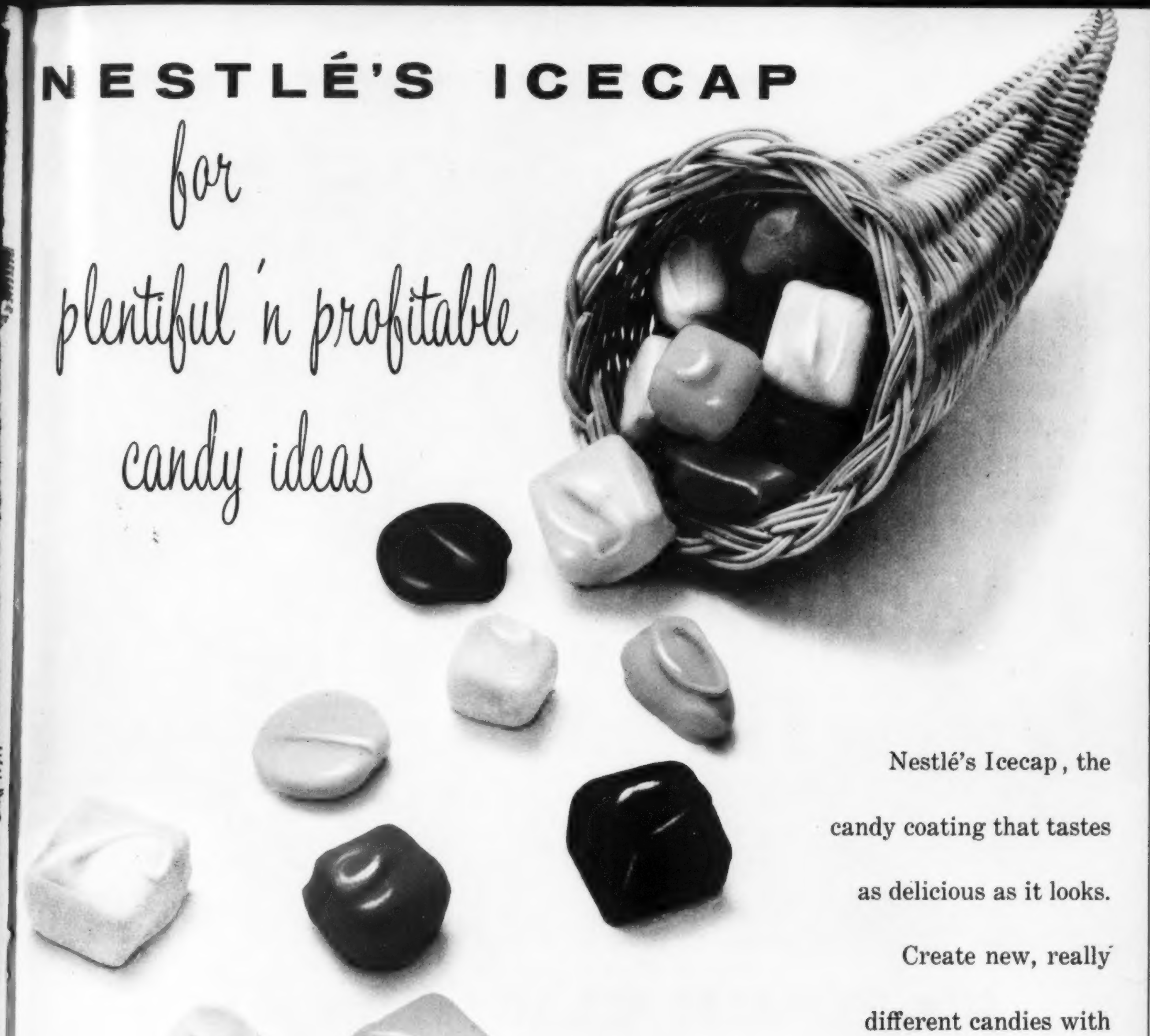
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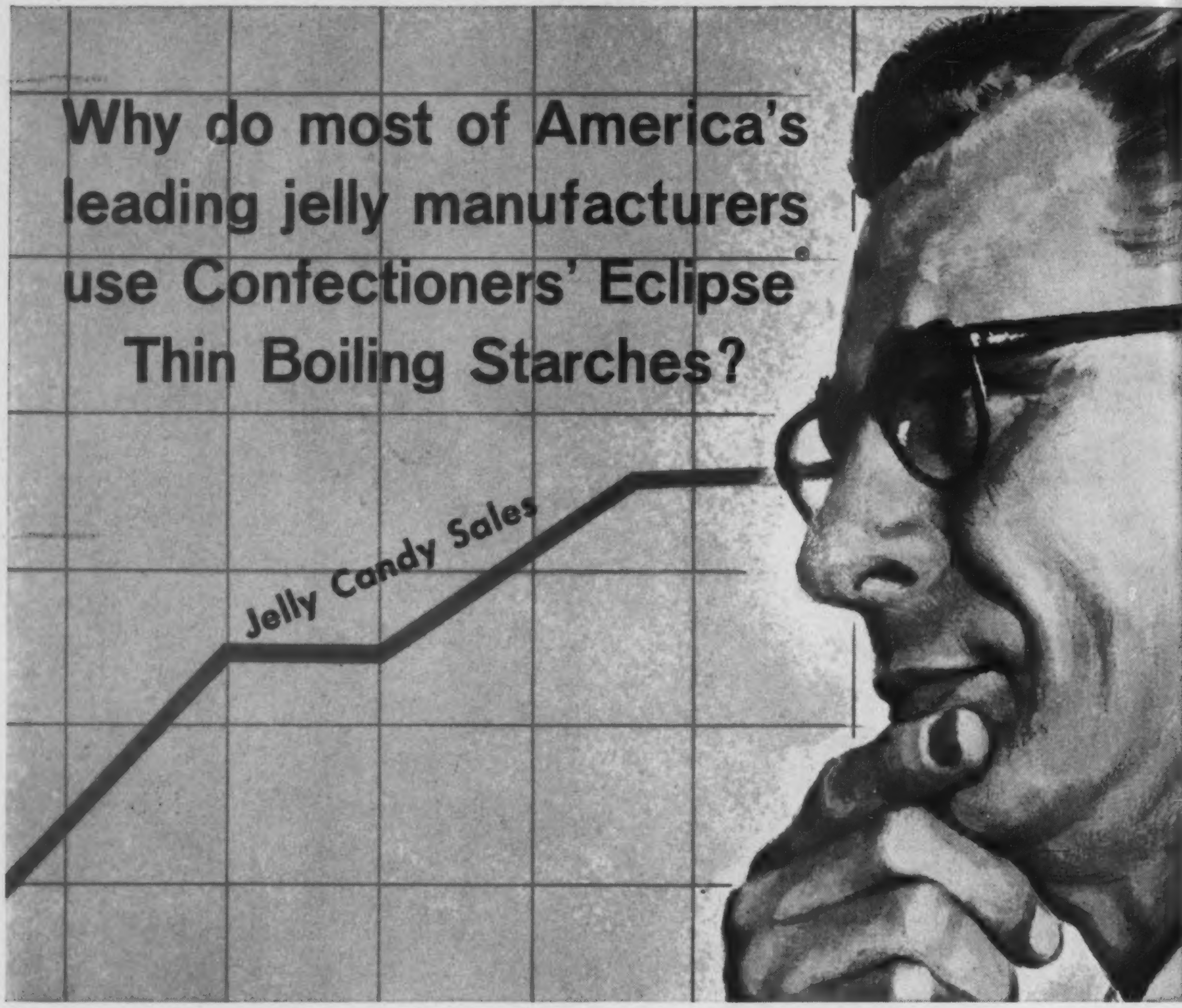
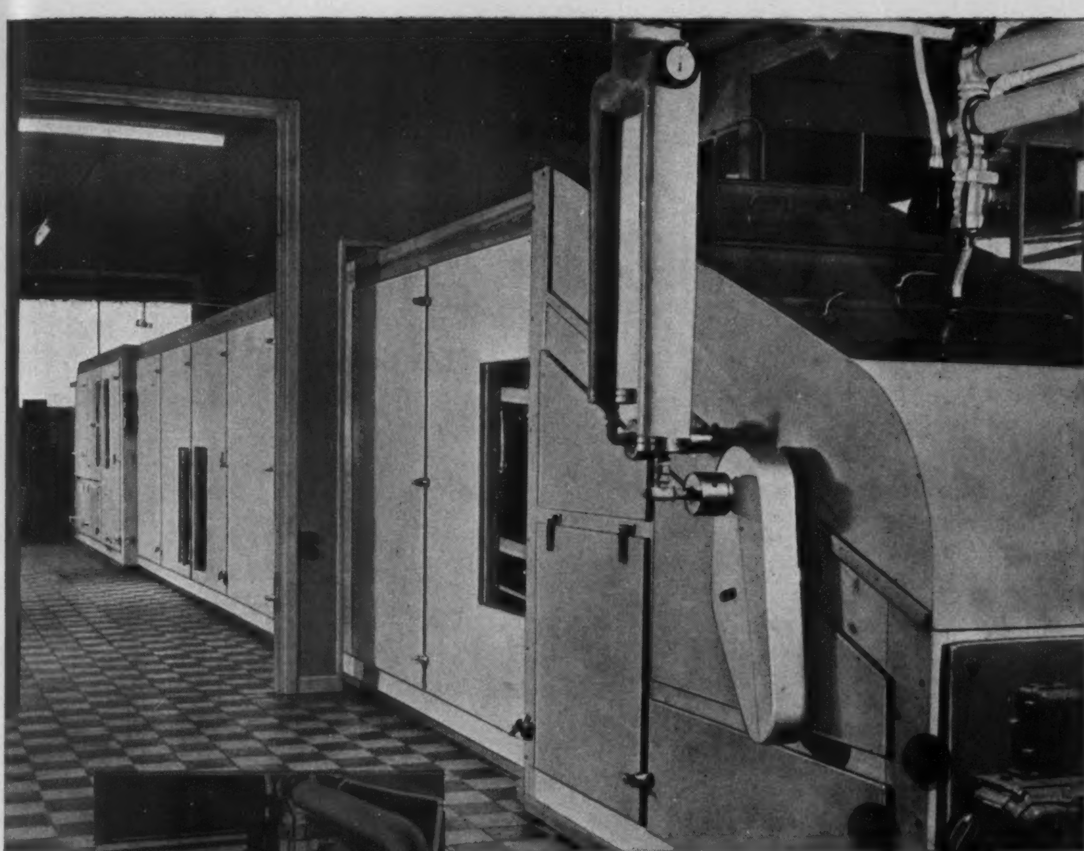
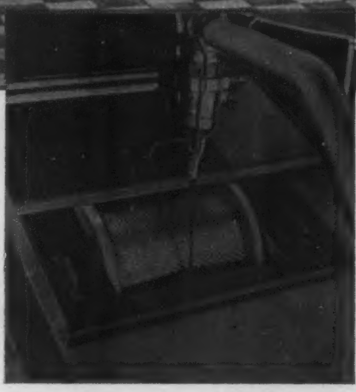
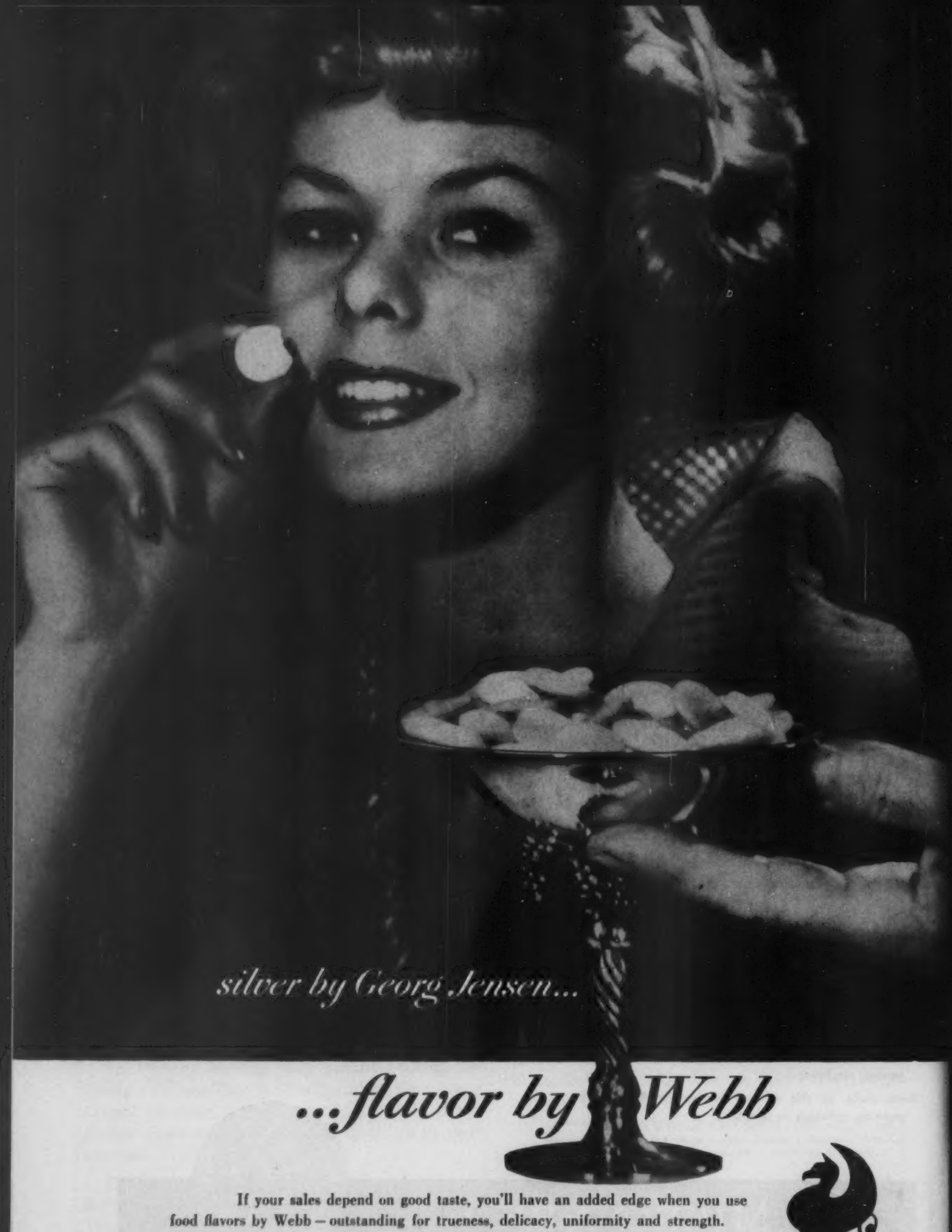

Why do most of America's leading jelly manufacturers use Confectioners' Eclipse® Thin Boiling Starches?
Jelly Candy Sales



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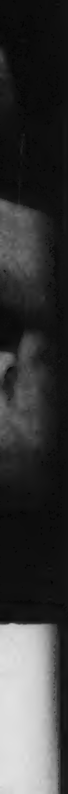

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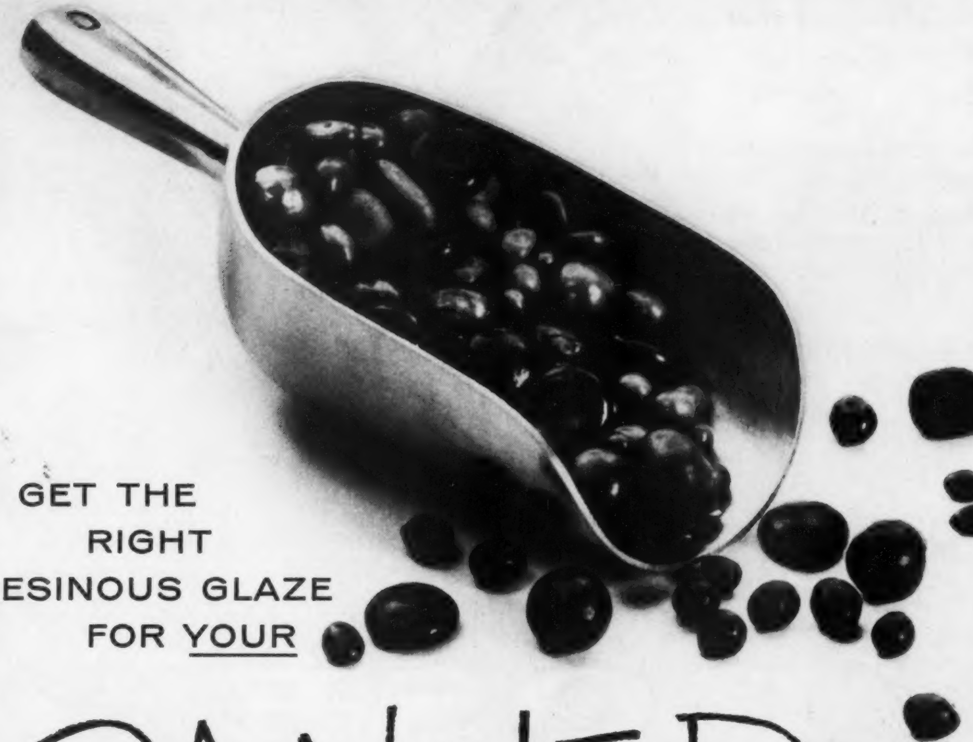

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TWIST WRAPPER
Output: 400 to 450 pieces per minute depending on shape of piece
The Rose 5 I. S. T. is designed for the twist wrapping of irregular shaped candies.
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ROSE F. W. T. TRIUMP
Form, Cut, Fold or Twist Wrapping Machine
Output: 550-600 pieces per minute on twi
550 pieces per minute on fo
The Rose Triumph is designed for high speed production of twist or f wrapped pieces showing the cut s through the wrapper. The wrapper m be cellophane, wax paper, wax-back foil, with or without understrip.
Designed for today's jet-speed production requirements...
ROSE
Now is the time... in this keen competitive market... for you to install these advanced high speed wrapping machines so that you will be able to derive the benefits and profits from their high speed and lower cost per unit production.
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ROSE
F. W. T.
Form, Cut and Twist Wrapping Machine
Output:
550 pieces per minute
The Rose F. W. T. is designed for forming, cutting and twist wrapping rectangular or cylindrical shaped toffees and hard candies in cellophane or wax paper, with and without an understrip or, wax paper with an overstrip.
ROSE Type 4 B. R. F.
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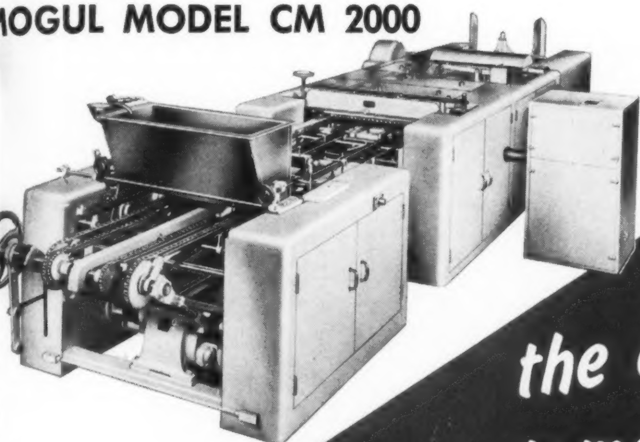

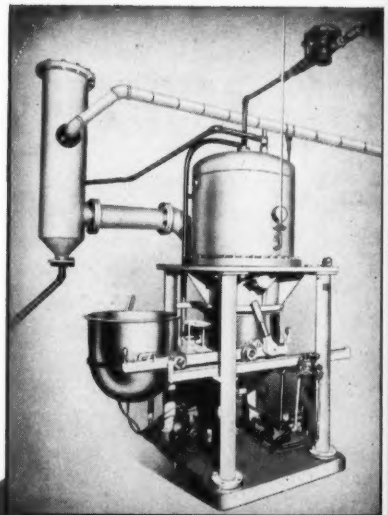

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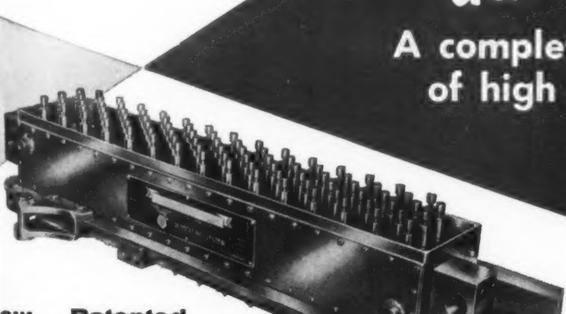

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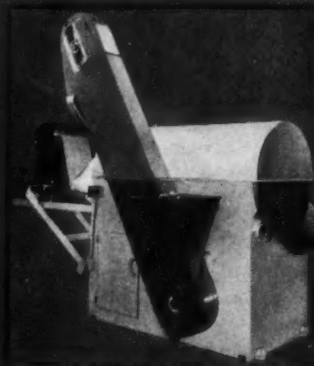

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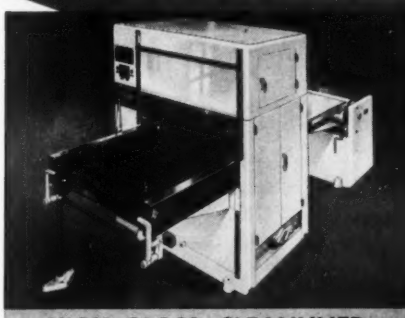

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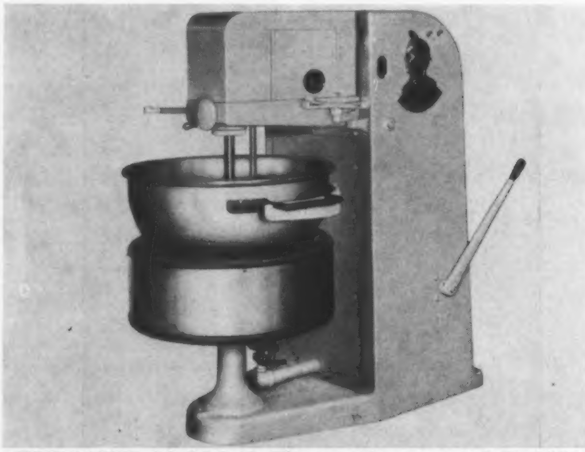
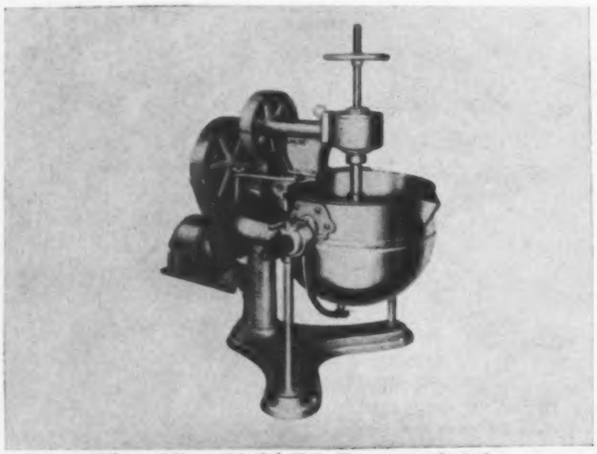
When you require equipment to cook, mix, beat, cool, size or cut, let Savage Bros. Co. show you how to lower your cost through the efficiency and durability of Savage Bros. Co. machines.

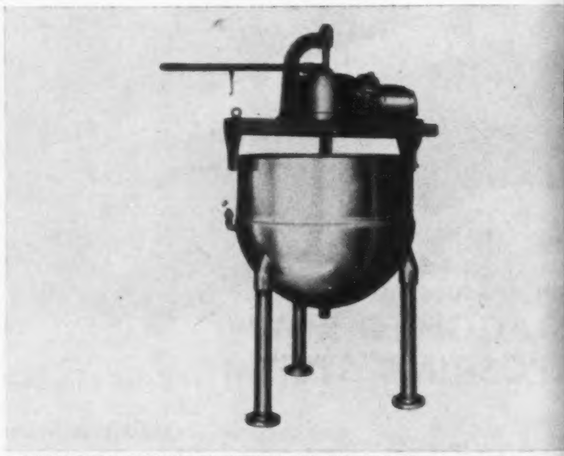


FIRE MIXER—Model S-48—Thermostatic gas control. Variable speed. Single or double action agitator. Kettle size 24" diameter by 12½" or 16" deep. Cook and mix candy batches to a predetermined degree.

FIRE MIXER—Model S-3 or S-2—Original break-back featur Manual gas control. One speed. Single or double action agita tor. Model S-3 kettle 24" diameter, 12½" or 16" deep. Mode S-2 kettle 22" diameter, 12" deep.



Savage Tilting Mixer—Model F-6—For caramel, fudge, nougat and cocoanut batches—Sizes: 50 gal. Stainless; 25, 35 and 50 gal. Copper Steam Jacketed Kettle. Double Action Agitator. Bevel Gears enclosed with oil seal. Direct motor drive with V belts for quiet operation.



SAVAGE MIXING KETTLE, Model C-3. For gum drops an other gum candies. Sizes 30 gallon to 250 gallon. Stainle steel as illustrated or copper steam jacketed kettle. For 10 pounds or 125 pounds working steam pressure. Double actio agitated. Direct motor drive with gear head motor.

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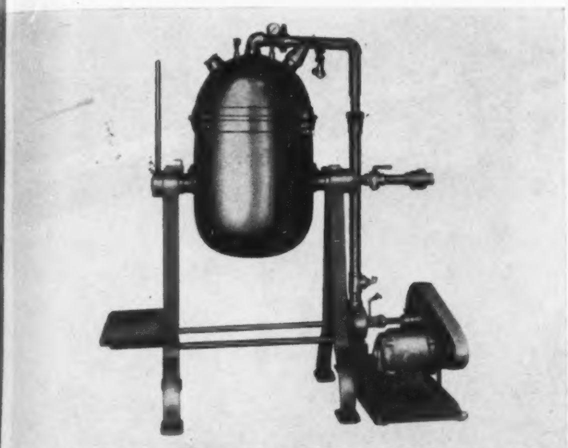

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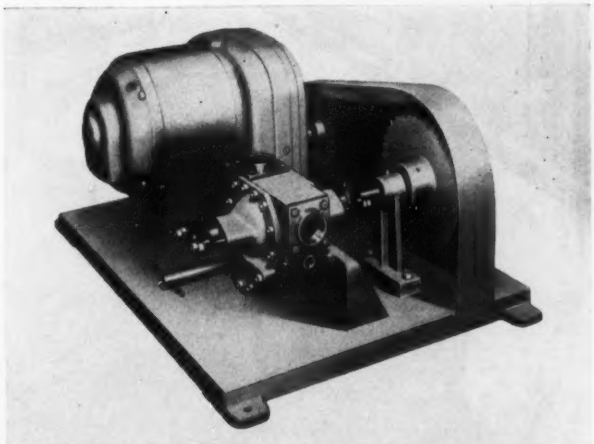

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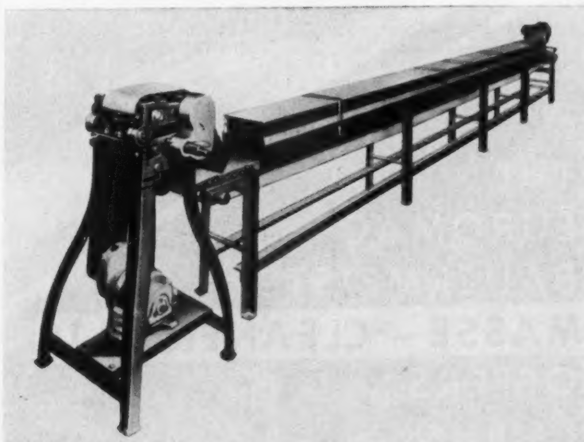

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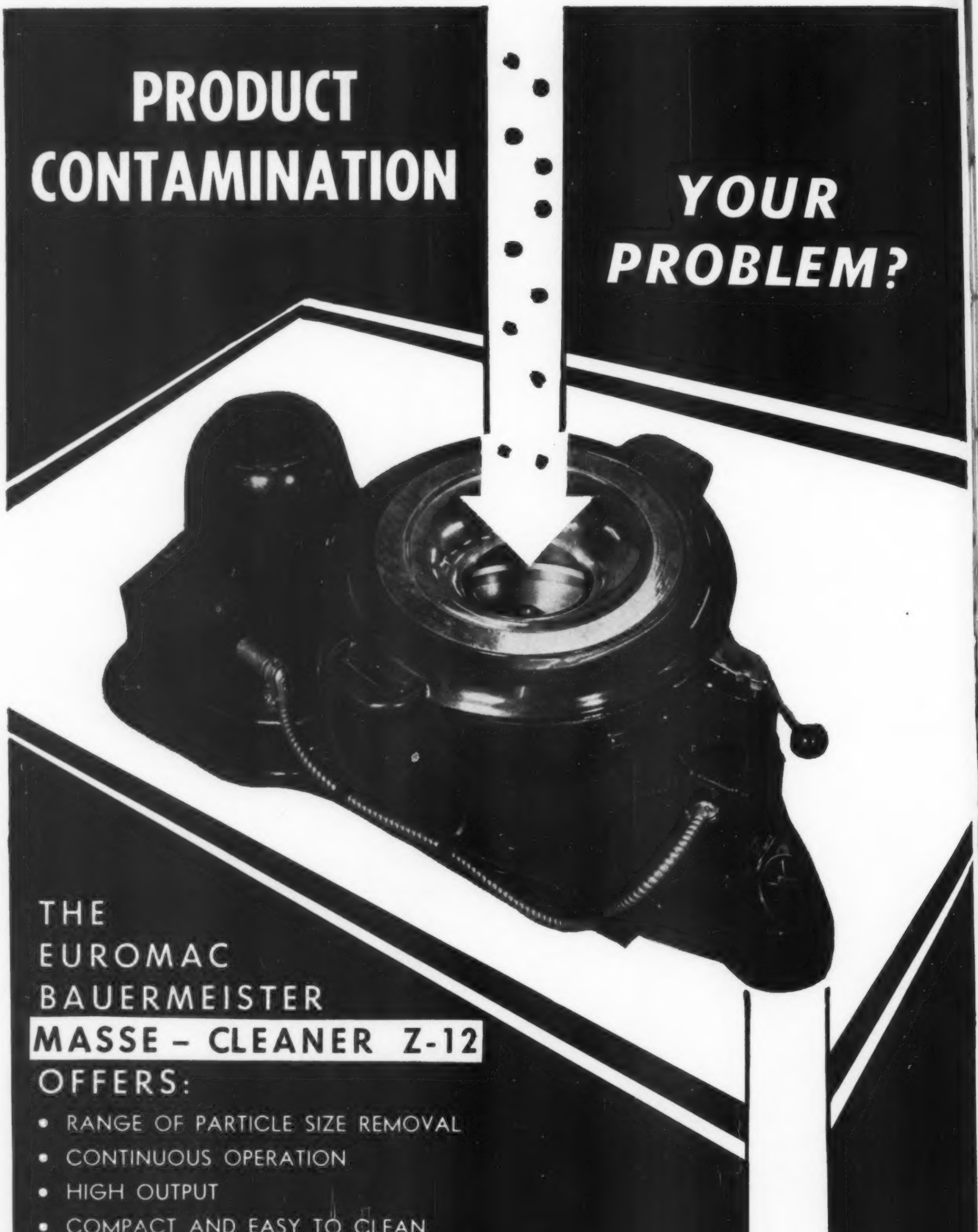
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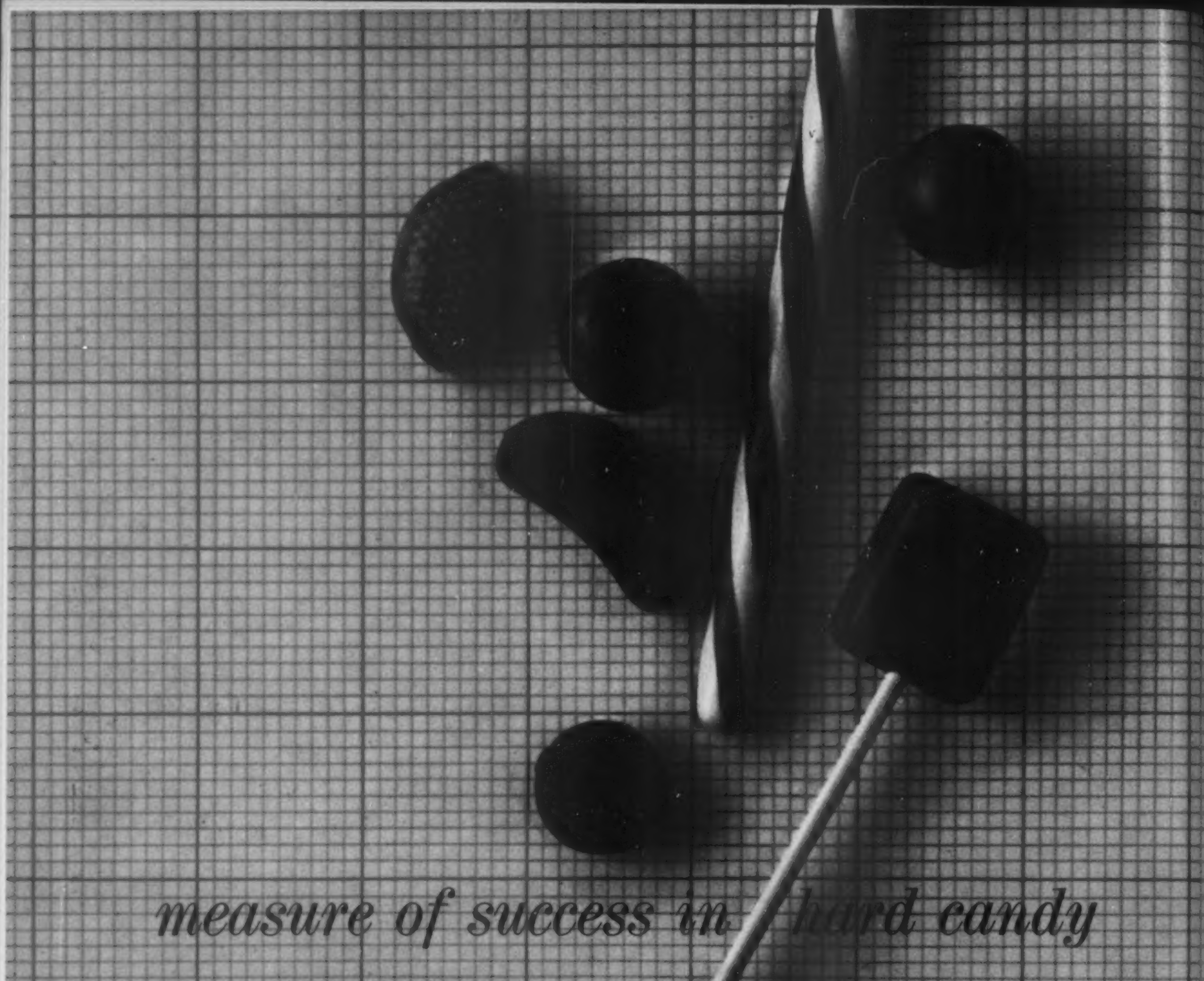
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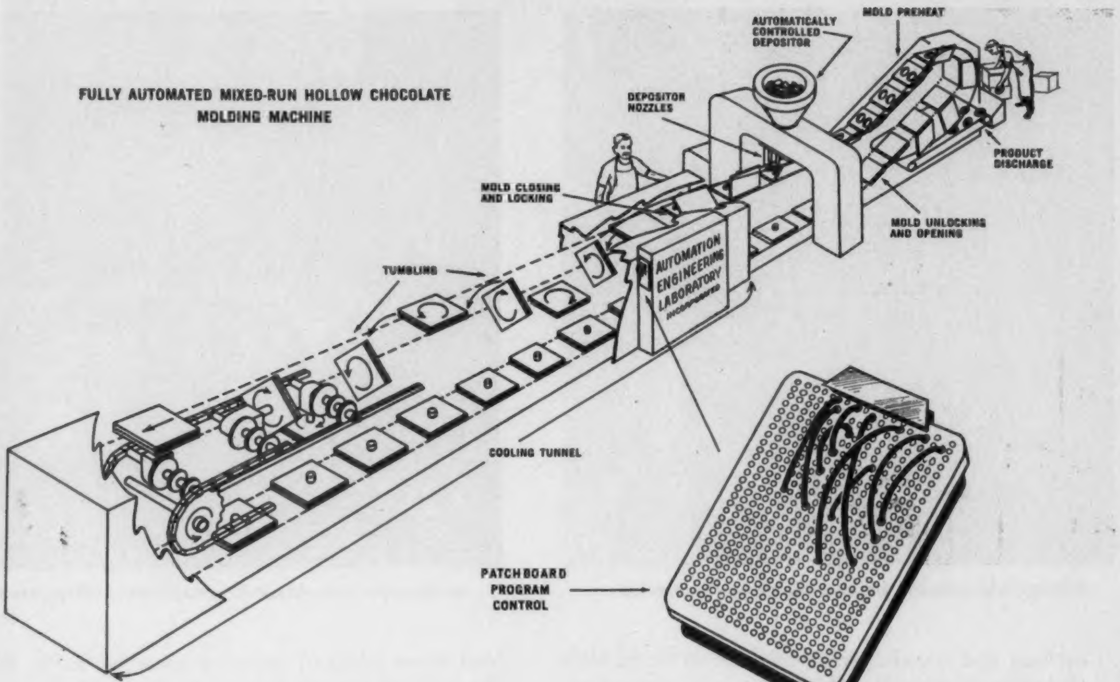


The AEL automated mixed-run chocolate molding machine used by Bortz Chocolate Novelties operates on a continuously moving, endless chain belt through mold filling, closing, tumbling and cooling, opening, and demolding. The weight and number of deposits per mold are pre-programmed with the patch panel shown at the lower right.

Automatic, mixed-run, mold plant

BY WAYNE BORTZ, BORTZ CHOCOLATE NOVELTIES
RICHARD S. WHITE, AUTOMATION ENGINEERING LABORATORY

A fully automated, mixed-run hollow-chocolate molding machine—the first of its kind—has been operating at Bortz Chocolate Novelties, Inc., Reading, Pa., for almost three years.

The machine's most significant feature is its flexibility. The designers, Automation Engineering Laboratory, Incorporated, Stamford, Conn., developed a computer-like selector patch panel control unit. Through this panel, Bortz can mix as many as twenty different types of molds in a single run, while maintaining fully automatic operation.

Birth of a Machine

About five years ago, Bortz sought an improved way to produce hollow-chocolate articles. Hand-operated lines were becoming less profitable and the machine methods available would not adapt well enough to the seasonal changes in Bortz's production needs.

AEL, specialists in "step-by-step" tailoring of automation programs and equipment, studied the problem and reported to Bortz that such operations could be automated. As a result the two firms entered into a joint development program.

The first step in designing this new machine was to formulate plans and submit drawings outlining the general concepts of an automatic method for manufacturing mixed runs of hollow-chocolate novelties.

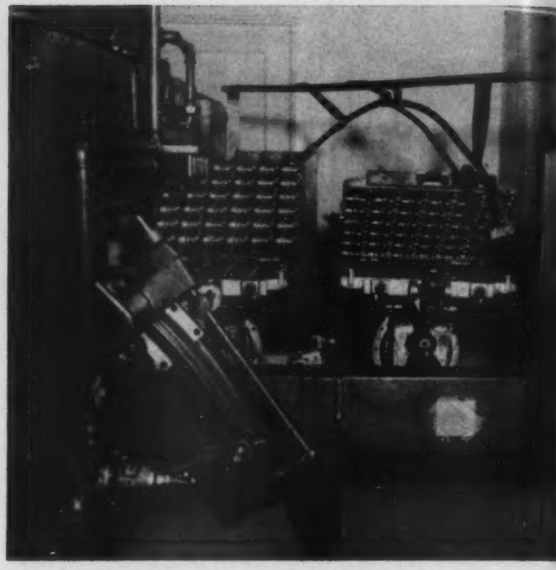
Step two, following Bortz's approval of the initial concepts, was to make a small-scale prototype model to demonstrate the validity of the over-all concepts, especially the method of tumbling and automatic mold opening and closing.

With this low-cost model, AEL was able to demonstrate the basic mechanical methods and to study the features for the production unit.

Next the design of the production unit started. In the course of the design, a full scale single mold station was built. This was taken into Bortz's plant, and subjected to extensive tests, to establish the exact cooling and tumbling cycles and other data, to which the equipment would be designed.

The design was then completed, and after fabrication, the unit was extensively tested at AEL's plant. Bortz shipped chocolate to AEL, and a small

Automatically controlled depositor fills molds with chocolate . . .



. . . and the molds close, then lock, automatically. As they move through

melting and blending unit was set up, to provide chocolate to the depositor. This was particularly advantageous, as it permitted production plant product handling tests of the new automation control features.

The new equipment was installed in Bortz's plant during the summer of 1957.

Mold Requirements

The AEL machine is designed to use any combination of up to twenty different standard mold types in a total of 92 mold frames, mounted on a continuously moving chain. Bortz averages about fifteen programs (different groups of molds) per run. A typical Bortz run is shown in the accompanying table.

Bortz maintains an inventory of 337 molds, representing 35 different shapes and sizes. If the machine were not designed for mixed runs, Bortz would need an inventory of 3,200 molds, i.e., 92 identical molds for each of the 35 mold types, costing about $100,000.

Mixed-Run Programming

Because the number and size and shape of cavities differ between mold types, the weights and timing of deposits will vary widely. This variation is anticipated automatically, without intervention by the operator, once the patch-panel program is set.

The operator determines the weights and numbers of deposits needed for each mold program (each group of molds in a single run) and records the information on a Production Program sheet. The order and sequence on this sheet fixes the order that the groups of molds will follow in the run.

Molds are then inserted into conveyor frames in the predetermined program order. The patch-panel is wired to coincide with this order, with lead wires plugged into the panel so as to give the proper deposit timing and weight for each different type of mold in the run.

The patch-panel provides for ten different deposit weight settings and ten different deposit rate settings, each of which can be infinitely varied within the range of the automation unit.

Depositing Chocolate

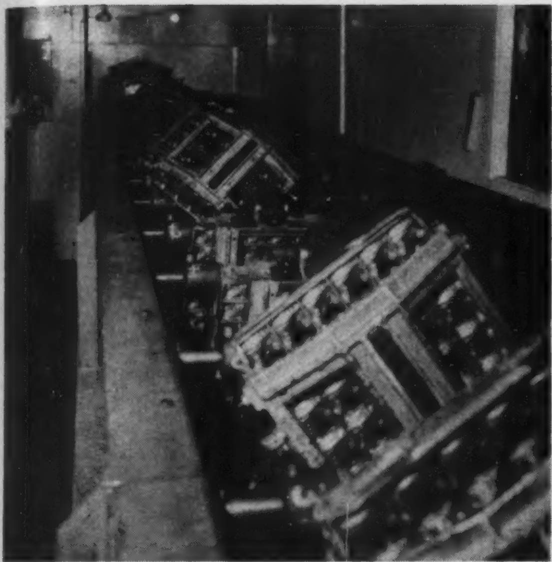
The AEL molding machine uses a special Bindler chocolate depositor, extensively modified in order that it might accept the automatic controls. The depositor is stationary, depositing into the mold cavities as they pass by. This combination of continuously moving molds with a fixed depositor is possible because of the remarkable depositor control assembly. Maximum capacity is 60 deposits a minute, of 2-3/4 ounces through each of six nozzles. For small items, double heads can be put on each nozzle.

AEL has modified this depositor for automatic control so that it will adjust itself to the deposit weight and timing needed for each group of molds in the run. The significance of automated deposit is to allow continuous mixed runs, which is an important feature of the machine.

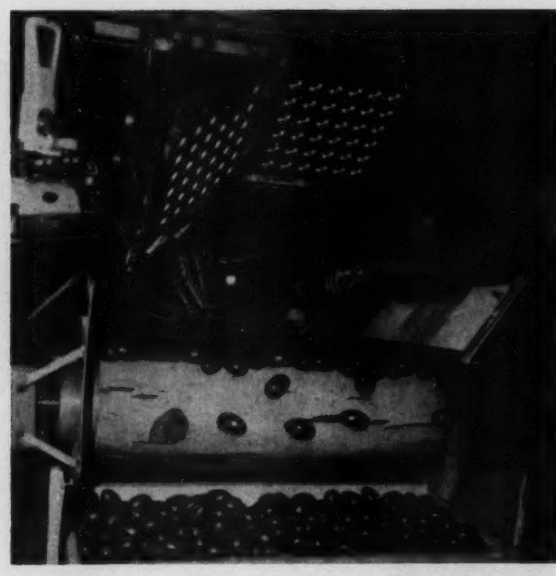
A tab on the lead mold of each program in the run hits a sensing switch sending a signal to the control panel to change programs and adjust deposit weight and timing for the new program. The automated program change adjusts the depositor settings within a fraction of a second.

Mold Closing

Closing of molds, following the depositor, is completely automatic. A cam follower on the lid of each mold follows a split guide rail which leads the lid to a closed position. A toggle lock, on the base of the mold, is then snapped into a locked position by means of a cam lifter.



. . . the cooling tunnel the molds are tumbled in two directions . . .



. . . after cooling, opening and demolding takes place automatically.

Mold Tumbling

The locked molds are mounted in frames supported on bevel-gear driven shafts. These molds remain locked in a vertical position until the molds reach the cooling tunnel—at which time the unit rotates around the support shaft and the mold frame rotates around its vertical pivot shaft.

Tumbling continues for a distance of about 40 feet, and lasts slightly under six minutes. The mold tumbles four times around the vertical axis (pivot shaft) for each turn around the horizontal axis (support shaft). A complete horizontal turnaround requires 50 seconds.

When the tumbling is completed, the tumbler locks in a vertical position again, and is carried over the end of the conveyor, moving toward the mold opening and demolding area in an inverted position while continuing cooling. Cooling tunnel temperature at the entrance is about 30 degrees Fahrenheit, and at the exit is about 50 degrees Fahrenheit.

Mold Opening and Demolding

As the chilled and tumbled molds progress to the demolding station, cams unlock, and then open the molds.

An operator is stationed at the demolding end of the conveyor. His main duty is to inspect the molds to ensure that they are clean and ready for another filling cycle. Periodically he taps the molds with a mallet to jar stuck chocolate forms out of the mold and onto the resilient foam-rubber padded conveyor belt below.

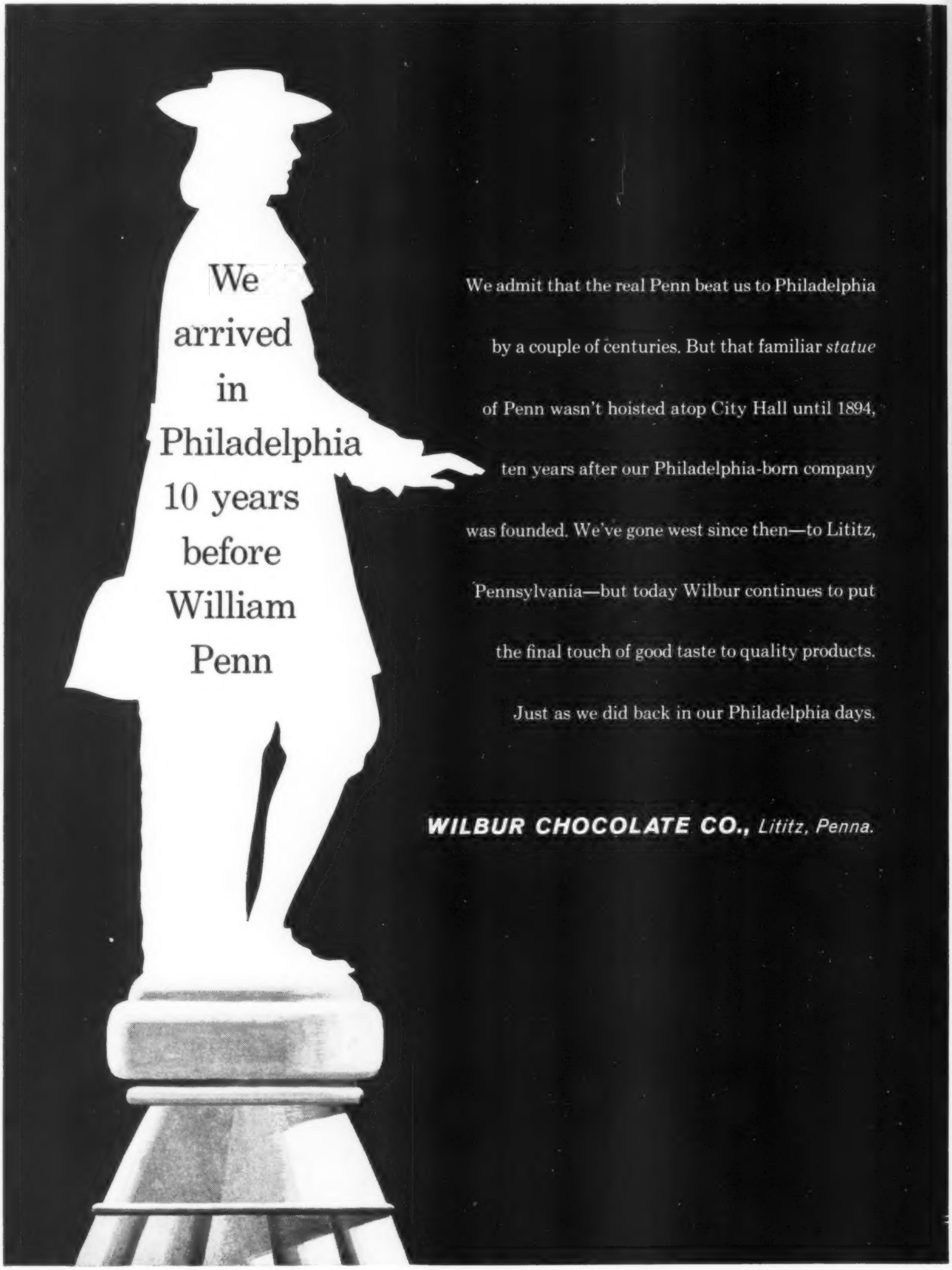
Trays at the end of the rubber belt collect the chocolate forms. When filled, the trays are moved to the decorating or packaging areas of the plant.

The open and empty molds continue past the demolding station, and are preheated by infra-red heat prior to refilling at the depositor station.

After 2-1/2 years of operation, Wayne Bortz says: "We are really turning out a volume of hollow goods now, and I think we have the most efficient operation in the country".

Typical Bortz Eleven Program Run

Cavity Size	Shape	Cavities/Mold	Chocolate/Mold	Portion of Run
1/7 ounce	small egg	120	1 lb. 1.15 oz.	1/3
2/7 ounce	small egg	60	1 lb. 1.15 oz.	
2/5 ounce	small rabbit	32	13 oz.	1/6
2/5 ounce	small hen	32/42	13 oz.	
2/5 ounce	small chick	32/42	13 oz.	
2/5 ounce	small rooster	32/42	13 oz.	
1 ounce	eggs, rabbits, hens, roosters	20 av.	1 lb. 4 oz.	1/2
2 1/2 ounce	chicks	8 av.	1 lb. 4 oz.	


We arrived in Philadelphia 10 years before William Penn
We admit that the real Penn beat us to Philadelphia by a couple of centuries. But that familiar *statue* of Penn wasn't hoisted atop City Hall until 1894, ten years after our Philadelphia-born company was founded. We've gone west since then—to Lititz, Pennsylvania—but today Wilbur continues to put the final touch of good taste to quality products. Just as we did back in our Philadelphia days.
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Cacao butter and fat bloom

BY DR. S. VICTOR VAECK
Central Laboratory of the
Ministry of Economic Affairs
Brussels, Belgium

Fat bloom is a well-known defect of chocolate and chocolate-coated confectionery, and one which has plagued the industry probably since its early beginnings. Much has been written on this problem, but until recently very little was known about its real nature.

In the following I intend mainly to give an account of the investigations which were carried out in our laboratory since 1948. In that year our attention was directed for the first time to the problem of fat bloom in chocolate and I decided to start a small research project. At that time we were unaware of the fact that the Pennsylvania Manufacturing Confectioners' Association was also sponsoring research in this field. As it was apparent from the beginning that the purely empirical approach had been pursued for tens of years without much success, at least insofar as an understanding of the problem is concerned, a scientific study of cacao butter appeared more promising. It has always been the policy in our laboratory to leave the people in charge of research a free hand and above all not to hurry them to produce anything practical. We have found that nearly always practical applications appear automatically in the wake of new knowledge. On the other hand the investigations had to be done with very limited means.

Previous Investigations on Cacao Butter

Cacao butter had been studied rather extensively before 1948. As early as 1900 it was observed that it could show wide variations in melting point (48). Between the world wars important studies were made by Whymper (49) and Fincke (14) (15) but these were more of a practical nature. However, they showed that cacao butter can crystallize in a stable and at least one unstable form, that tempering has the aim of producing crystallization in the stable form and that fat bloom is probably due to the transformation of the unstable in the stable form. A similar conclusion was reached by the British Cocoa and Chocolate Industries Research Association in a confidential report (18). More fundamental were the investigations of the Dutch school and two important papers should be mentioned. The first by Albers (1) who observed three definite melting points at about 24°, 29° and 34°C. The second by Reinders and others (33) who made the most complete study of cacao butter up to that time. Although they identified only two forms with complete melting points 24°C and 35°C, their microscopical, thermal and dilatometric investigation of the melting and solidification of these forms was very comprehensive. They also were the first to measure crystallization velocities and to distinguish between the nuclei-formation rate and the linear crystallization velocity.

In the following period only minor progress was made. Hofgaard (19) perfected the dilatometric technique, Straub and Malotaux (38) the calorimetric approach.

Summarizing we can say that by 1940 it was

generally agreed that fat bloom was related to the existence of different polymorphic forms or modifications of cacao butter.

Previous Investigations on Glycerides

Polymorphism is the property possessed by most solid substances of existing in two or more different crystal forms.

When the transformation of one form into the other is reversible, it is called enantiotropic; when it is irreversible, that is, if one modification is always unstable, it is called monotropic. Cacao butter being a mixture of glycerides, it is obvious that one must first learn what is known about the pure glycerides. However, most workers on cacao butter seemed to have overlooked this point. Fatty acids and glycerides offer classical examples of monotropic polymorphism and they had been studied extensively for a long time. As early as 1852, Duffy (10) discovered 3 modifications of tristearin, tripalmitin and other glycerides. After 1930 when Malkin at Bristol started his studies of the thermal and X-ray properties of fatty acids and glycerides, developments were very rapid. From 1945 onwards the American school with Lutton and others also played an important role.

What were the results of this work? For the triglycerides, which interest us in the first place, in brief, the following (32) Tri-glycerides, like other compounds with long hydrocarbon chains, can exist in the solid state in various polymorphic forms. As a rule three solid modifications are observed which are generally designated β, β' and α. In some cases four or even five modifications have been reported: β, β', β'', α and γ (or vitreous). The explanation for the existence of these different polymorphic forms lies in the fact that the hydrocarbon chains are parallel and can assume different angles of tilt with reference to the terminal planes of the crystals. The lowest angle, i.e. the most inclined chain, corresponds to the most stable form, the highest angle (90° or a vertical chain) to the least stable. It is also believed that the different forms have different crystallographic sub-cell symmetry (7).

In general, only the β-form, which has the highest melting point, is stable, the melting point decreasing with decreasing stability. For a few glycerides the stable from is reported to have a β'-symmetry, no β-form being known (22). Each unstable modification has a tendency to change into the next more stable, higher melting form. At any given temperature the more stable form has a higher density and a lower heat-content than the less stable form. It is important to note that the melting point of the stable form and possibly of the unstable forms can show small variations corresponding to differences in the degree of stabilization (31). About mixtures of glycerides very little was known. Russian workers had studied mixtures of saturated triglycerides (12) (13) and found that they formed three series of solid solutions corresponding to the three polymorphic forms. The solid solutions partally decomposed with time. This was a confirmation of older reports (21).

Research in Our Laboratory:

A) Starting Point

Obviously the first thing to do was to apply existing knowledge on the polymorphism of the triglycerides to cacao butter. Unfortunately, important gaps remained in this knowledge. The composition of cacao butter was rather well known through the work of Hilditch (17) and Meara (27). The main glycerides were believed to be 2-palmitooleostearin (52-57%) and 2-oleodistearin (18-22%) with minor amounts of 2-stearodiolein (6-12%) 2-palmitodiolein (7-8%) and 2-oleodipalmitin (4-6%). Fully saturated glycerides amount to only about 2.5%, triolein to 1%. It is now known that the configuration attributed to the principal glyceride was wrong, and that it is really 2-oleopalmitostearin (23) (8).

Only of the symmetrical disaturated glycerides (oleodistearin and oleopalmitin), of the fully saturated glycerides and of olein had the polymorphic behaviour been studied. In the absence of data on the major constituent, oleopalmitostearin, no definite predictions could be made. We could only presume that the behaviour of cacao butter might resemble more or less that of the then known disaturated glycerides. For these Malkin postulated 5 modifications (26), Lutton only 4 (24) while the data of Daubert (9) agreed with those of Malkin. In fact this dispute has not been settled to this day. Anyhow it appeared reasonable to look after at least four modifications. Cacao butter being a mixture, not a pure glyceride, these modifications would not show a definite melting point, but they would melt over a rather extended temperature range, and probably these melting ranges would overlap. Nothing could be predicted about the stability of the unstable forms. On the one hand observations of Malkin (25) had shown that small amounts of impurity have a stabilizing effect, on the other the overlapping of melting ranges could speed up transitions.

B) Microscopical and Melting Point Investigations

Microscopical observation in polarized light, as first done by Reinders (33) shows easily that cacao butter is able to exist in at least two modifications, the stable one growing slowly at the expense of the unstable form. (40). This is represented by Fig. 1-5. A drop of molten cacao butter was placed on a slide and covered with a cover-glass. The slide was rapidly chilled at 0°C (32° F) and kept at that temperature for half an hour. It was then brought to room temperature (about 20° C or 68° F) and continuously observed for several weeks. At zero time (Fig. 1) a bright microcrystalline mass is observed. After about two hours this has become much duller but very bright crystal nuclei appear which grow rapidly and after 5 hours small spherulites of about 50 microns in diameter can be distinguished (Fig. 2). For the first two days growth of the bright crystals continues at the same rate—Fig. 3 shows the appearance after 30 hours. Thereafter the growth is much slower but continuous. After 5 days (Fig. 4) the bright crystals occupy

Fig. 1. Growth of stable form of cacao butter at 20° C (68° F). O hours. Magnif. 110 X

Fig. 2. Growth of stable form of cacao butter at 20° C (68° F.). 5 hours. Magnif. 110 X

Fig. 3. Growth of stable form of cacao butter at 20° C (68° F). 30 hours. Magnif. 90 X

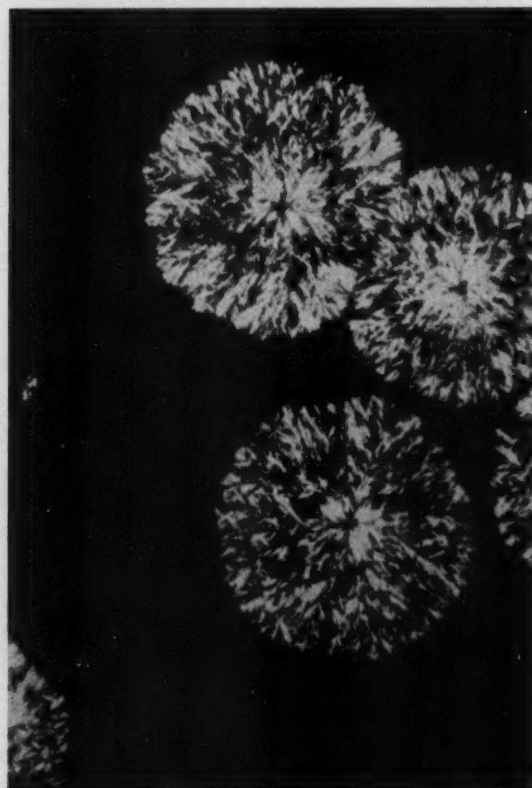

Fig. 4. Growth of stable form of cacao butter at 20° C (68° F) 5 days. Magnif. 75 X

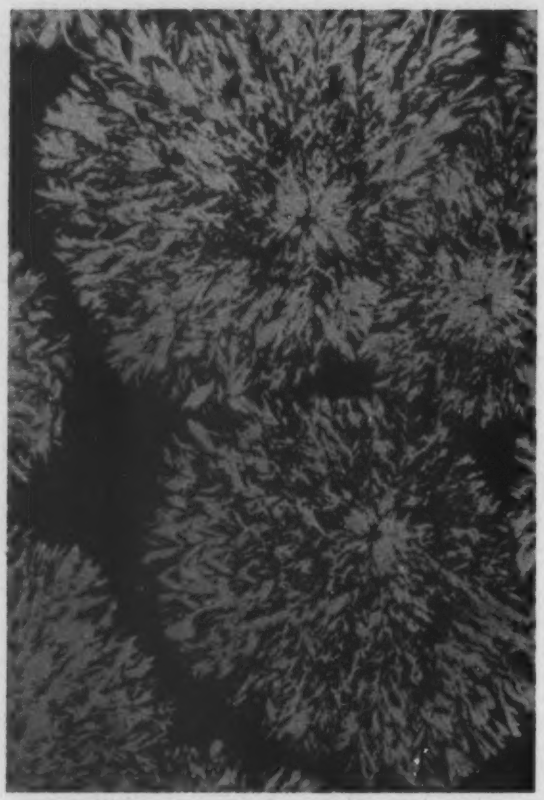

Fig. 5. Growth of stable form of cacao butter at 20° C (68° F) 27 days. Magnif. 75 X

nearly the whole field. After 27 days the transformation may be considered complete (Fig. 5).

Careful examination also reveals the following facts:

1) Immediately after crystallization the crystalline mass of the unstable form is very bright (Fig 6). It gradually becomes less visible, and after one hour it is already much duller (Fig. 7). This cannot be due to melting, as the equalization of temperatures cannot take more than a few minutes. Thus some change of the unstable form must take place. However, no modification of the visible crystal structure is involved.
2) The stable form appears to be formed by needle-like crystals, as shown in Fig. 8. Large needles, most easily obtained by crystallization from solvents, can sometimes be observed. Small needles can be obtained by slow crystallization from the melt (Fig. 9).
3) When cacao butter has been solidified for some hours and which contains numerous stable crystals, is heated to about 30° C (86° F) in order to melt the unstable phase, and rapidly cooled, a pattern of many smallaxial crosses generally appears (Fig. 10) among the usual stable and unstable modifications. These optically active spherulites had been observed by Reinders, in simple saturated triglycerides they correspond to the α-form, according to Quimby (31). After a few days at room temperature, they change into the stable modification (Fig. 11). Cacao butter

Fig. 6. Unstable form of cacao butter (Bright α-form) Magnif. 275 X

Fig. 7. Unstable form of cacao butter (Dull β'-form) Magnif 275 X

Fig. 8. Needles of stable form of cacao butter. Magnif 275 X

Fig. 9. Small needles of stable form of cacao butter crystallized from the melt. Magnif. 275 X

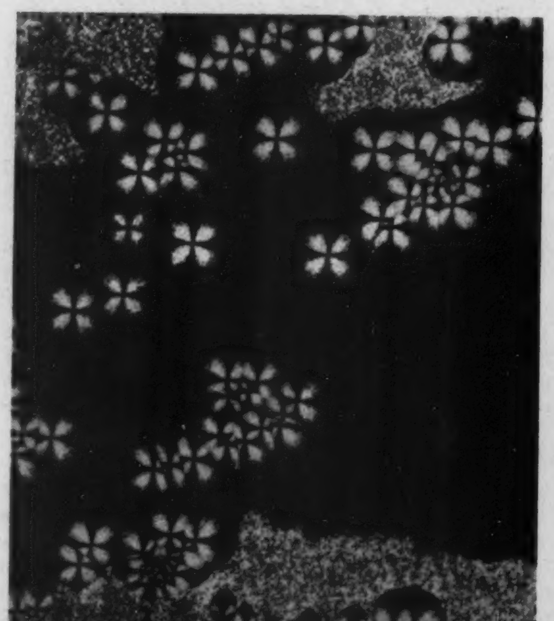

Fig. 10. Axial crosses of β'-form among dull β'- and bright β-crystals. Magnif. 75 X

Fig. 11. The same after 5 days at room temperature. Magnif 75 X

containing 15% butterfat shows a somewhat different behaviour. The stable form is generally duller and shows less tendency to form large crystals.

We also examined a sample of Borneo tallow, a natural fat which has a composition very similar to that of cacao butter. It contains about 80% disaturated, 15% monosaturated and 5% trisaturated glycerides (39) as against cacao butter 77%, 21% and 2%. The main glycerides are oleodistearin (40%) and oleopalmitostearin (30%). Under the microscope no change was observed at 20° C (68° F) but at 28° C (82.5° F) bright spherulites grew in a similar way as with cacao butter.

Further information could be obtained by studying the melting points of the different modifications (40). By melting point is meant the temperature of complete clarification, corresponding to the upper end of the melting range.

Using well established techniques, we were able to prove for the first time that cacao butter can exhibit four different melting points and thus is able to exist in at least four modifications. These melting points are compared in Table I with those found by Malkin (26) for 2-oleodipalmitin, which melts at about the same temperature in the stable form.

Table I. Melting Points (°C) of 2-Oleodipalmitin and Cacao

Form (after Malkin)	β	β'	β''	α	γ
2-Oleodipalmitin (26)	37.5°	35°	29°	21.5°	12°
Cacao butter	34-35°		27-29°	21-24°	16-18°

The agreement between the two sets of melting points is remarkable, although for the β- and β'-forms of 2-oleodipalmitin there is only one corresponding form of cacao butter. The β-form of the former could be obtained by Malkin only by crystallization from solvents. With cacao butter this always leads to some degree of fractionation; also, crystallizing cacao butter from solvents often gives the modification with melting point 27-29°.

In view of the correspondence shown in Table I we called the four modifications of cacao butter β, β'', α and γ. However, all later authors used the symbol β' for the second form, so in the following we will adopt this custom.

The different polymorphic forms of cacao butter were obtained in the following way:

Gamma form—This had never been observed before because it is extremely unstable. Near its melting point of about 17° C (62.5° F) it changes into the α-form within a few seconds, and even at 0° C (32° F) this transformation takes less than 1 minute. The melting point can only be observed by using very thin capillaries and a "thrust-in" technique. The capillary containing the molten fat is chilled suddenly by plunging it in ice water or in a dry ice-acetone mixture for a few seconds then thrust at once in a bath heated at a temperature near the presumed melting point. By repeating this operation many times at different bath temperatures, the lowest temperature at which the cacao butter becomes completely clear for about one second can be established, and this is the melting point of the γ-form.

It is also the lowest temperature at which cacao butter can exist in the liquid form. It follows that very rapid cooling always produces initial crystallization in the γ-form. Because of the extreme unstability of this modification it is difficult to decide whether it is microcrystalline or glassy. Microscopical observation seems to indicate that it is in fact microcrystalline.

Alpha form—This we have never observed to crystallize directly from the melt. Below the γ-melting point it is always the γ-form which crystallizes first, above this temperature the crystals are of the β' type, at least in pure cacao butter.

However, as we have seen before, the γ-form changes very rapidly into the α-form, and this explains why the α-form had always been considered as the typical unstable form of cacao butter (1) (33). It is the only one observed when the melting point of rapidly chilled cacao butter is determined by gradual but rapid heating. The melting point varies between 21° and 24° C (70°-75° F); it is inversely proportional to the iodine number of the cacao butter.

Although more stable than the γ-form, the α-form changes readily into the β'-form at temperatures a few degrees below its melting-point. The transformation is complete in about an hour. The α-form is always microcrystalline.

Beta prime form—This results from the transformation of the α-form, but it can also crystallize from the melt at temperatures between the γ- and α-melting points, or from solvents. In order to determine its melting point, a capillary containing molten cacao butter is chilled rapidly (α-form) then kept at room temperature for an hour. When heated gradually, a melting point of about 28° C (82.5° F) is found.

Microscopically it generally resembles the α-form, but the crystals are less bright. Sometimes it takes the appearance of very regular spherulites, as we saw earlier. These crystals definitely belong to the β'-form, as shown by their relative stability and melting point, whereas for simple triglycerides this crystal pattern appears to belong to the α-form (31).

Although the β'-form was first detected by Albers (1), its existence was ignored by later authors. When cacao butter is cooled slowly, it is the β'-form which is obtained, the α-form which appears initially, changing into the β'-form with a rise in temperature. A large block of cacao butter can thus warm up to about 25° C (77° F) a temperature in excess of the α-melting point, the initial temperature being about 18° C (64.5° F). The β'-form is much more stable than the γ- and α-forms, its transformation into the β-form takes at least a month at room temperature.

Beta form—This is the stable form which results from the slow transformation of the β'-form. It generally appears as bright spherulites which are

quite different from the dull β' disordered crystals. It can also be obtained by crystallization from the melt at temperatures in excess of the α-melting point. The crystallization is very slow when the liquid is left undisturbed. It can however be enormously accelerated by agitation. The crystals appear as needles or more rarely as prisms. Finally, the β-form can also be obtained by crystallization from solvents.

The capillary melting point can easily be determined in the usual manner. It is necessary to fill the capillary by thrusting it in the cacao butter solidified while agitated or which has been left at room temperature for some weeks. The complete melting point lies nearly always between 34 and 35° C (93.2-95° F) and it is inversely related to the iodine value, that is the degree of unsaturation of the cacao butter.

Although cacao butter in the stable form always melts under 35° C (95° F), we found it possible, by prolonged heating in the partially liquified state at a few degrees below this temperature, to grow crystals which disappear only when heated at about 37° C (98.5° F) (44). This has been observed by several other authors (49) (20 (16). It could not be established whether these crystals melt at a higher temperature because they contain a larger proportion of high-melting glycerides than usual, or because they have been transformed in a still more stable form.

More important from a practical point of view is the observation that heating to a few degrees above the complete melting point does not destroy completely all centers for crystallization. Solid cacao butter which is heated to a temperature a few degrees above 35° C (95° F) and which is perfectly clear, on cooling will often solidify in the β'-form at about 25° C (77° F) whereas after heating at 50° C (122° F) it will always solidify in the α-form at about 18° C (64.5° F) when cooled not too slowly. This phenomenon is well known and it has been described for many substances. It has been assumed that the stability of crystal nuclei at temperatures above the melting point is due to adsorption on solid particles, whereby the free energy of the aggregates is lowered and their stability increased (3). This theory is very attractive for it explains why the persistence of crystal nuclei is more readily observed in chocolate liquor than in pure cacao butter, and why the presence of β-nuclei promotes crystallization in the β'-form even on rapid cooling a fact we have often observed.

It is now possible to obtain a better understanding of the changes observed under the microscope. The bright microcrystalline mass observed in the first place belongs to the α-form. When after an hour it appears much duller, the change into the β'-form is complete. There is no difference in shape between these α and β' crystals, but in other circumstances the β'-crystals can appear as optically active spherulites. The bright, slow-growing spherulites are obviously made up of β crystals. It is interesting to note that in the case of the simple saturated triglycerides, the bright spherulites correspond to a "bright" β' (31) which would tend to confirm the impression gained from Table I, that the stable form of cacao butter is really a β'-form.

C) *Calorimetric and Dilatometric Investigations*

A study of the microscopical appearance and of the capillary melting points can only give qualitative information about the existence of different polymorphic forms. In the case of a mixture of glycerides such as cacao butter, the capillary melting point indicates the end-point of a melting range. It is very important, both from a scientific and from a practical point of view, to know the extension of the melting range and the changes of heat content and specific volume during melting. It is well known that phase changes, such as melting or transformation of one polymorphic form into the other are associated with definite heat effects and volumetric changes. From these data the proportions of the different phases, either solid or liquid, can be estimated at any given temperature.

We made many calorimetric determinations, using a very simple apparatus derived from that of Straub and Malotaux (37). A small sample of cacao butter is heated or cooled by maintaining a constant temperature difference between the sample and its surroundings. Under these circumstances the heat input or output is very nearly constant and it can be determined from tests with known substances. Our dilatometric measurements were made with a volumetric dilatometer after Hofgaard (10). The experimental details are fully described in previous publications (41) (42). The results obtained clarified and completed the picture resulting from the calorimetric studies of Pichard (29) (30), Reinders (33) and Straub and Malotaux (38) and from the dilatometric studies of Van Roon (46), Reinders (33), Hofgaard (19), Fincke (15) and Schnack (35).

The most interesting information can be derived from the melting curves. As an example, from the change in heat content of a sample of cacao butter, the heat of fusion throughout the melting range has been calculated. This is very nearly proportional to the percentage of liquid phase and is represented in Fig. 12. In order to enable the heats of fusion of the different polymorphic forms to be compared easily, the heat of fusion has been plotted from the liquid state = 0, in a negative direction.

It can be seen that cacao butter in the stable β-form begins to melt at about 20° C (68° F). The point of midmelting lies at about 30.50° C (87° F) and the end of the melting range at 35° C (95° F). Consequently, in order to determine this curve exactly, the cacao butter must have been kept for a long time at a temperature never exceeding 20° C (68° F). The total heat of fusion was established at 36 calories per gram; the specific heats for the solid and liquid phases were about equal and amounted to 0.50. This means that in going from 20° C to 35° C, 36 + 7.5 = 43.5 calories are needed. The melting curve of the β'-form is more difficult to establish, while that of the α-form can only be

sketched roughly. For these forms heats of fusion of 28 resp. 19 calories per gram were calculated. The α-form may however, have been contaminated with some γ-form. The γ-form is too unstable to be studied. It is clear that when cacao butter is rapidly solidified, only about half of the heat of fusion is removed and 9 calories per gram are rapidly liberated when the α-form changes into the β'-form. Eight more calories can be liberated during the change $\beta' \rightarrow \beta$, but this generally takes a very long time, unless a large amount of β-nuclei are preformed. This will be discussed further on.

It is interesting to note that at the complete melting point of the β'-form, nearly half of the stable form is already molten. Similarly, at the α-melting point, nearly half of the β'-form and a small fraction of the stable form, are liquified.

Similar information can be derived from the dilatometric measurements. Curves for the melting dilations are given in Fig. 13. For the stable form the curve is exactly the same as that obtained from the heat of fusion, except for the section under 28° C (82.5° F). Here the proportion of liquid phase is higher than that corresponding to the heat of fusion curve, and melting appears to start at 15° C (59° F). It may be assumed that the melting dilation curve gives the more accurate picture, because the dilatometric method is static and allows a more complete equilibrium to be established (3). However, the difference is small, and the point of mid-melting is 30.5° C (87° F) with both methods. The melting dilation found is 0.097 ml/g. considerably more than that reported by previous authors (19), (15), (35). The coefficient of expansion of solid cacao butter in the β-form is 0.00054 ml/g/° C between −20° C (−4° F) and 10° C (50° F); it is smaller below −20° C where there is a point of inflection. For liquid cacao butter a coefficient of expansion of 0.00085 ml/g/°C is found. This agrees well with the values found by previous workers. For the solid state, our value is much lower than that of Hofgaard (0.00090 ml/g/°C) which proves that the samples of this author were not in the stable state, but higher than established values for oils and fats (2) which are however based on expansibilities at temperatures near −40° C (−40° F), that is below the point of inflection.

For the β'-form a reasonably accurate melting dilation curve could also be determined. It lies about 1° C lower than the heat of fusion curve over most of its range; melting starts at 5° C (41° F). The total melting dilation is 0.080 ml/g. This means that in the solid state the volume occupied by the β'-form is about 1% greater than that of the stable β-form. For example, at 0° C (32° F) the β-form has a specific valume of 0.9974 ml/g, the β'-form one of 1.0098 ml/g.

The α-form is not stable enough for a melting curve to be taken. By the use of a special technique, the specific volume in the solid state could be determined. At 0° C (32° F) its value is 1.0288 ml/g, or about 3% greater than for the β-form. The total melting dilation is 0.060 ml/g.

In going from the liquid state at 30° C (86° F) to the solid state at 10° C (50° F) a total contraction of nearly 7% is found if the crystallization leads to the α-form. This increases to 8.3% in the β'-form and 9.6% in the β-form.

Summarzing, the melting curves of cacao butter show that the different polymorphic forms behave like solid solutions, melting over a rather short interval of about 6° C wide, with a small part beginning to melt at a much lower temperature. The lower part of each curve overlaps with the higher part of the next. It is interesting to compare the melting curves of the stable forms of cacao butter, Borneo tallow, butterfat and a mixture of 85% cacao butter with 15% butterfat. These are shown in Fig. 14 after transformation of the heat of melting curves in percentage of liquid curves. It can be seen that the Borneo tallow curve is similar to that of the cacao butter, except that it lies about 4.5° C (8° F) higher and shows a final segment of steep slope, apparently produced by the trisaturated glycerides present. Butterfat melts over a wide range and even at 0° C (32° F) it is about one fourth liquid. Cacao butter with 15% butterfat has a melting curve about 2° C (3.5° F) lower than that of pure cacao butter, with incipient melting at a much lower temperature.

The solidification curves are of less fundamental value, yet they can yield important practical information when interpreted with some care. This is due to the fact that crystallation depends on various factors such as rate of heat transfer, agitation, interfacial conditions and presence of crystal nuclei, as will be discussed later.

When cooling completely molten cacao butter without agitation, the important factor is the rate of heat transfer, which depends upon sample size and temperature gradient. If the outer temperature is constant, the temperature gradient changes continuously, and this makes the interpretation of the cooling curves more difficult. Pichard used this method extensively for the detection of adulterations and also for the estimation of the degree of temper. (29) (30). We prefer to maintain a constant temperature gradient with the same apparatus as used for determining melting curves (39). Fig. 15 shows cooling curves obtained with a 2 g sample of cacao butter and temperature differences between sample surroundings from 8° to 1° C. The liquid cacao butter had been very carefully filtered and degassed. With a high temperature gradient and correspondingly rapid cooling only a slight break at about 15.5° C (60° F) is observed. When the cooling rate is slowed down, the temperature of the sample passes through a minimum and rises to a maximum, owing to the heat released by the crystallization of the α-form and by the transformation of the α- to the β'-form. This is proved by the fact that the total crystallation heat released on slow cooling is very nearly 28 cal./g, corresponding to the melting heat of the β'-form. With very rapid cooling the α-form is obtained.

By extrapolation it is possible to find the minimum and maximum of the curve corresponding to an infinitely slow cooling rate. For the cacao butter

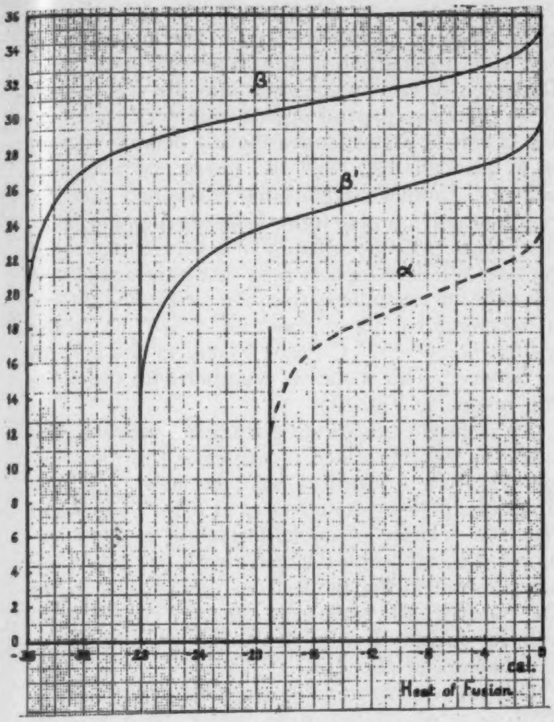

Fig. 12. Heat of fusion curves of three polymorphic forms of cacao butter.

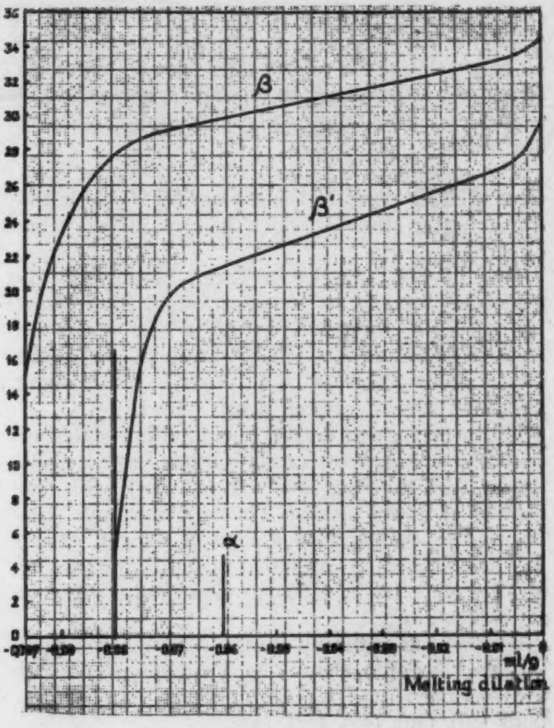

Fig. 13. Melting dilation curves of two polymorphic forms of cacao butter.

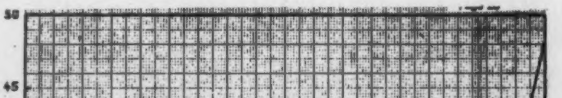

Fig. 14. Percentage of liquid curves of stable forms of (1) Borneo tallow (2) Cacao butter (3) Cacao butter with 15% butter-fat (4) Butterfat.

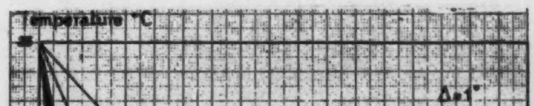

Fig. 15. Cooling curves of cacao butter with various temperature gradients.

of fig. 15 these are 17° C (62.5° F) resp. 23° C (73.5° F). The minimum corresponds exactly to the melting point of the γ-form. This proves that cacao butter has no tendency to crystallize, except in the γ-form, when agitation and solid/liquid interfaces are absent.

The maximum lies about 2° C above the complete melting point of the α-form (21.2° C for the cacao butter studied, which has an iodine value of 37.6).

For different samples of cacao butter, the extrapolated minima and maxima varied from about 16° C (61° F) resp. 23° C (73.5° F) for an iodine value of 38.8 to 18.7° C (65.7° F) resp. 25° C (77° F) for an iodine value of 34.4, which is the extreme range for normal pressed cacao butter.

When preformed crystal nuclei, either stable or unstable, are present, crystallization begins much sooner and the heat evolved increases with the amount of nuclei present. Thus cooling curves can be used to evaluate the degree of temper, as we will see further on. Agitation and the presence of foreign solids (as in chocolate liquor) also promote crystallization.

Foreign fats naturally modify the cooling curves obtained under a given set of circumstances and this has been used for the detection of adulterations (30), (36), (45), (47), (43).

D) Crystallization and transformation speeds

Very important, also from a practical point of view, is an exact knowledge of the kinetics of crystallization and transformation. In cacao butter we can have crystallization from the melt and transformation of one modification into the other. Both these processes depend upon two factors, the number of crystal centers appearing in a definite volume in a specified time, and the linear crystallization velocity. Another complication is the fact that the different polymorphic forms have overlapping melting ranges. All this adds up to a very complicated picture. We have already seen that pure unagitated cacao butter crystallizes from the melt in the β-form at temperatures above about 24° C (75° F), in the γ-form below −17° C (62.5° F) and in the β'-form in between. This is shown, together with the melting ranges, in Fig. 16.

An accurate quantitative study is possible only with the β-form, which of course is the most important from a practical point of view. This was first attempted by Reinders et al (33). They found that the velocity of nuclei-formation in pure unagitated cacao butter decreases with the increasing temperature in the range from −10° C (14° F) to 20° C (68° F) while the linear crystallization velocity increases with increasing temperature to a maximum at about 21° C (70° F).

Our investigations have confirmed these results. With pure unagitated cacao butter, the formation of β-nuclei from the melt is exceedingly slow, perhaps impossible if interfaces could be completely excluded. However, in solid unstable modifications

Fig. 16. Melting and crystallization ranges of pure cacao butter.

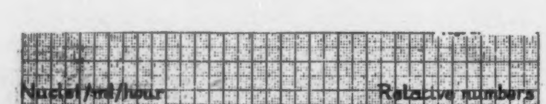

Fig. 17. β-nuclei-formation velocities. (A) Pure unagitated cacao butter (B) Agitated chocolate liquor.

β-nuclei appear at a measurable speed. We found that at 21° (70°F) the velocity of nuclei-formation is about 12 nuclei/ml/hour, at 9° C (48° F) 900 nuclei, at −4° C (25° F) 70,000 nuclei. This is represented by line A in Fig. 17. It can be seen that the logarithm of the number of nuclei formed is inversely proportional to the temperature, as might be expected from the classical equations of kinetics.

In chocolate liquor the solid-liquid interfacial area is very large, and during tempering the liquor is continually stirred. Under these conditions, β-nuclei-formation can take place from the melt. It is impossible to determine the number of nuclei formed, but from the time necessary to obtain optimum temper, relative speeds can be calculated. Line B in Fig. 17 is based on results obtained by Neville et al. (28) and Grover and Wertheim (18) between 29° C (84.2° F) and 33° C (91.4° F). It is remarkable that the slope of this line is apparently not very different from that of line A. It should not be forgotten that at these temperatures a considerable proportion of the cacao butter is liquid at equilibrium.

For a mixture of 85% cacao butter and 15% butterfat, we found that the velocity of nuclei-formation is about 5 times slower than for pure cacao butter, which means that for equal velocities, the temperature of the mixture with butterfat is 4.5° C (8.1° F) lower. As for the linear crystallization velocity of the β-form, Reinders et al found a maximum of 0.040 mm/minute at 21° C (70° F) falling to less than a tenth of this value at 13° C (55.4° F) and 28° C (82.4° F). This relates to the growth of the β-form at the expense of the β'-form in pure cacao butter. However, these values are much too high and we found an average linear velocity of 0.0064 mm per hour, at 21° C (70° F). This is achieved during the first hours of growth; after a certain time, depending upon the number of centers present, the linear velocity decreases sharply, owing to the exhaustion of β'-crystals at the surface of the β-crystals. Exceptionally, for reasons unknown, velocities up to 0.027 mm per hour have been observed.

The complete transformation, at room temperature, of solidified cacao butter into the stable form, can take from a few minutes to about one month, according to the number of nuclei present.

Considering now the β'-form, we have seen that it can crystallize from the melt in the temperature range between the melting points of the γ- and α-forms, or that it can result from the transformation of the α-form. It is impossible to make exact quantitative determinations such as for the β-form, but we found that for this modification also the nucleation rate increases when the temperature is lowered, while the crystallization velocity has a maximum at about 18° C (64.5° F). The latter can be estimated from the rate of heat evolution in a sample of cacao butter which has been quickly chilled below 0° C (32° F) and then kept in a container at a given temperature. The temperature of the cacao butter rises above that of the surroundings because heat is given up, partly by the $\gamma \rightarrow \alpha$ transformation, but mostly by the $\alpha \rightarrow \beta'$ transformation. Fig. 18 shows the curve representing these temperature differences for a 2 g sample of cacao butter (A), compared with a similar curve for a sample of Borneo tallow (B). For the cacao butter, the temperature difference and consequently the heat evolved increases to a maximum at 18° C (64.5° F) after which it falls off rapidly to zero at a temperature of about 24° C (75° F) corresponding to the mid-melting point of the β'-form. The maximum for the Borneo tallow lies about 7° C (12.5° F) higher, as might have been expected from its higher melting range. For the α-form also, the rate of nuclei-formation increases with decreasing temperature in the range from 14° C (57° F) to −15° C (5° F) while the growth rate appears to increase when the temperature is increased. Both are naturally extremely fast as compared to the similar rates for the β'-form, which itself crystallizes much faster than the β-form. This is still more true of the γ-form which crystallizes in a few seconds at the most. As this is the least stable form it always crystallizes from the melt and the rate of nucleation can be determined from the curve representing the time elapsed between cooling to a given temperature (in a fine capillary) and incipient crystallization, as a function of temperature. We have determined such curves for many samples of cacao butter and mixtures with other fats (43). The curve representing the inverse of these crystallization delays is in fact a so-called Tammann curve, which gives the relative nuclei-formation rate in

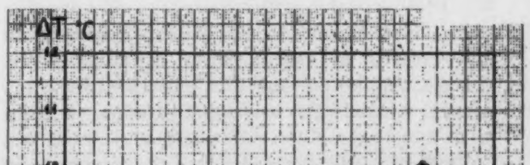

Fig. 18. Temperature rise above surroundings, due to $\alpha \rightarrow \beta$ transformation, for (A) Cacao butter (B) Borneo tallow.

function of the temperature. When plotted logarithmically, this becomes a straight line such as we found already for the β-form. Fig. 19 represents the lines for samples of cacao butter (A) Borneo tallow (B) butterfat (C) and a mixture of 85% cacao butter with 15% butterfat (D). The curvature of the upper part is probably due to the fact that the heat transfer rate is not infinite. The lower limit results from interference by β'-crystals.

A comparison with Fig. 17 shows that the nuclei-formation velocity increases about ten times faster with decreasing temperature for the γ-form of cacao butter than for the β-form. Borneo tallow shows a similar behaviour, but the line lies about 4° C higher. The mixture of cacao butter with 15% butterfat lies 0.6° C lower (1° F), while pure butterfat gives a line with a much lower slope.

For a large number of different cacao butters the γ-nucleation rate lines all fell within a 2° C range.

E) Practical Conclusions

In the foregoing a summary of our work on cacao butter from 1948 to 1955 has been given, but nothing has been said on fat bloom. However, from these investigations we could draw a number of conclusions which go a long way toward clarifying our ideas on this practical problem, but were never released for general publication. Of course, not all these conclusions were new, and some had been advanced long ago.

Our conclusions can be summarized as follows:

1) The surface of chocolate is glossy because of the presence of a continuous film of very fine cacao butter crystals. Fat bloom results from the growth of rather large crystals of the β-form. At the surface this growth produces a bloom, while in the interior it produces a granular, sandy structure. Obviously no bloom can appear if all the cacao butter is and remains in the stable β-form. It is necessary that part of the cacao butter exists in an unstable state, either because the transformation into the β-form was not complete at the time of manufacture, or because part of the chocolate fat was melted during storage. The first cause can be removed by proper manufacturing technique, including tempering, moulding and cooling, the second is beyond control of the manufacturer if replacement of part of the cacao butter by foreign fats (other than those contained in natural ingredients) is forbidden, as in many European countries. From the melting curve of the β-form it can be seen that some melting takes place at all temperatures above 20° C (68° F) for plain or sweet chocolate, and above 10° C (50° F) for milk chocolate. Thus even under temperature conditions slow development of bloom is always possible.
2) The first condition for producing bloom-resistant chocolate is correct tempering. Tempering involves nothing but the formation of a sufficient number of β-crystals or nuclei. At the usual tempering and moulding temperatures which can be as high as 33° C (91.4° F) for chocolate, only a very small part of the cacao butter can exist in the solid state, even at equilibrium. However, it is the number of stable nuclei which is important, not their size, and some older theories which claim that tempering transforms the major part of the cacao butter in the stable form are clearly incorrect.
3) The β-nuclei required for correct tempering can come from additions of old chocolate shavings which are in the stable form, or they can originate in the liquid chocolate liquor. In the latter case the nucleation speed will depend, for a given mix, on the temperature and the degree of agitation. Fig. 17 shows that it is doubled every time the temperature is decreased for 2° C (3.6° F). Agitation is very effective because it breaks up aggregates into many small particles.

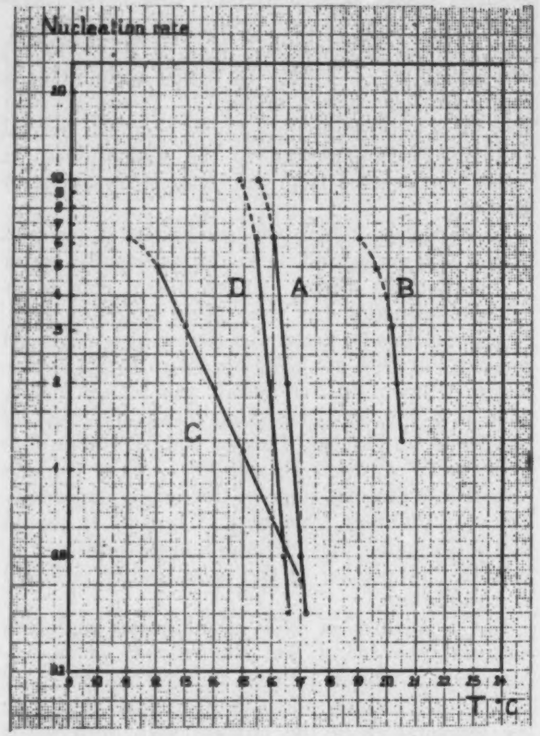

Fig. 19. γ-nuclei-formation velocities. (A) Cacao butter (B) Borneo tallow (C) Butterfat (D) Cacao butter with 15% butterfat.

It is easy to understand why tempering in a large kettle must be done at a higher temperature than in a small kettle, because in the first case the cooling time is much longer. It must not be forgotten that the temperature of the kettle wall can be appreciably lower than that of the chocolate liquor, so that the nucleation speed near the wall is very much increased. In a continuous temperer with intensive mixing, the chocolate liquor can be tempered in as short a time as one wishes, by choosing a suitably low temperature. Theoretically, it appears even possible to temper without mixing by cooling the chocolate below 0° (32° F) and keeping it

Continued to page 71

What The Confectioner Should Know About Heat-Sealing Polyethylene Packaging Films

BY RICHARD F. KOWAL, CUSTOMER SERVICE ENGINEER AND C. PHELPS, CUSTOMER SERVICE GROUP LEADER, U. S. INDUSTRIAL CHEMICALS COMPANY

Based on the latest market figures available, it now appears that by 1965 over 6 million pounds of polyethylene film will be used annually for *bagging* candy. In addition, there is a virtually untapped 42 million pound market potential in candy *overwrapping* which is now in its infancy for polyethylene film.

Polyethylene film offers relatively troublefree heat-sealing—one of the keys to any successful packaging operation. It is this characteristic which will help polyethylene achieve its usage potential in the candy industry.

However, confectioners should be aware of all the factors involved in heat sealing. This will result in better packaging and fewer package failures. Most of the heat-sealing principles have been studied by U.S.I. at its Polymer Service Laboratories, Tuscola, Illinois. The following represents current technology in the art.

Heat-seal characteristics

No matter what type of polyethylene film or bag is to be heat-sealed, there is practically always a sufficiently wide operating range of clamp time, sealing temperature, and sealing pressure to achieve satisfactory seals.

Generally speaking, the largest permissible sealing temperature ranges occur at high temperature levels, short clamp times, and low pressures; the largest permissible sealing time ranges occur at low temperatures, long clamp times, and low pressures. However, since machine conditions may occasionally fluctuate and get out of control, it is generally preferable to operate in a median region between the upper and lower limits.

The following relationships exist among the machine variables of clamp time, pressure and temperature:

- As sealing bar temperature goes up, the time or the pressure, or both, required to make a seal go down.
- As pressure of the clamping foot is increased, time or temperature, or both, required for sealing are decreased.

The most important effects of polyethylene resin and film properties are these:

- Going from a lower- to a higher-density resin of a given melt index tends to raise the temperature required to make a seal and to narrow the operating range in which a seal can be effected.
- Going from a higher- to a lower-melt index resin tends to widen the operating range in which a seal can be made.

Time and temperatures

There is a range (with upper and lower limits) of both time and temperature at which each particular polyethylene film can be successfully sealed. This range gives candy packagers sufficient machinery operating latitude when packaging with polyethylene.

The greatest temperature flexibility is achieved when using short machinery clamp times. The greatest time flexibility occurs when using low sealing temperatures. However, when working with high sealing temperatures the sealing time range is narrow, permitting the packager less machinery

flexibility. Closer machinery control is needed in this area for good seals.

Candy packagers will want to work in the short seal time range because it means faster product output.

Pressure—the "third ingredient"

The pressure applied to polyethylene film during heat-sealing also effects the time and/or temperature used in sealing.

The clamp time (pressure) required at a given operating temperature, the temperature required at a given time, or both, can be reduced when the sealing pressure is increased. But, as sealing pressures are increased the time and temperature ranges at which successful seals can be made are decreased. Confectioners should be aware that they have less package machinery flexibility when operating at high pressures even though this method can also be used to reduce sealing time.

Resin pcoperties effect sealing

In addition to machinery variables in heat-sealing polyethylene film, properties of the resins used to make the film also affect its sealing characteristics.

For instance, with a given clamp time, the higher the density of one of two resins with similar melt indexes, the higher the minimum temperature required for satisfactory heat sealing of film made from the resin. A polyethylene of 0.916 density becomes sealable at temperatures of roughly 30° to 50°F. lower than one of 0.924 density. A lower-density polyethylene has wider operating-temperature and time ranges and thus, generally, higher average temperatures and clamp times. Therefore, a higher-density polyethylene film gives the candy manufacturer less flexibility of operating conditions.

In the case of melt index, rather large changes in resin melt index (i.e. from 1.0 to 8.0) have comparatively little effect on the time-temperature region of satisfactory sealing of polyethylene film. However, the higher-melt index polyethylene, over some temperature ranges, seals a little faster than the lower-melt index polyethylene and it has a narrower operating range. The difference in the operating ranges is more pronounced with thin-gauge than with thicker-gauge films. The lower-limit curve is about the same for all melt indexes, and the spread occurs at the upper limits of the operating ranges. In other words, all polyethylene films regardless of melt index tend to give about the same lower time limit over the complete temperature interval, provided the film gauge and sealing pressure are the same. But a lower-melt-index film gives the packager slightly greater flexibility of operating conditions.

Agents are sometimes added to polyethylene resins to provide various degrees of slip in the finished polyethylene film. These slip agents have comparatively little effect on the time and temperature conditions required for heat sealing or on the range of conditions over which a heat seal can be made.

There is some slight effect at the upper and low-

er limits of the range, but the nature of this effect varies from film to film and follows no general pattern. This holds true in all concentrations of slip agent measured.

Film effects on sealing

Lastly, the physical conditions of polyethylene film have a distinct influence on obtaining excellent seals.

The thickness of the film (gauge) effects sealing time, temperature and pressure. A heavier gauge film requires a longer time to seal at a given temperature than does thinner films. Candy manufacturers can use the rule of thumb that clamp time is increased about 50% for every mil of added thickness when sealing films of 1 to 5 mil gauge. Since confectioners normally use polyethylene films in the 1 to 1.5 mil range, this rule has limited application.

The treatment of polyethylene film for printing is usually done by either flame or electronic methods. It has been found that flame treatment increases the minimum sealing temperature required for good sealing over untreated film. Although it has not been thoroughly investigated by U.S.I., indications are that electronic treating has no effect on the heat-sealing characteristics of polyethylene films.

Polyethylene films are made by one of three production techniques: water-quenching (flat extrusion), casting (extrusion onto chrome-plated chill rolls), blowing (tubular extrusion). Due to variations in molecular structure, the three materials, possess their own individual sealing characteristics. For instance, blown film provides a wider sealing range than cast film, however cast film can be sealed at lower temperatures.

In addition, when polyethylene films are produced, the molecules tend to line-up in one direction or another, either lengthwise or across the web of film (sometimes both). This condition is somewhat similar to the grain in wood–it is called "orientation". Usually polyethylene film is more highly oriented in the machine direction (lengthwise) than in the transverse (across). The limiting curves for sealing temperatures and bar pressures are normally at higher values when sealing in the transverse direction. This is true with films made by all three techniques.

Background to principles

In developing these principles U.S.I. defined a satisfactory heat seal as one which has a strength at least equal to that of the surrounding film and which will remain intact after failure of the surrounding area upon applying stress to the seal.

All tests were conducted with film made from U.S.I.'s PETROTHENE* film grade resins (typical of those normally used in the packaging industry).

Tests were made using a heated-bar sealer–the most common technique. However, all principles and relationships established with this typical unit are valid for other film sealing techniques as well.

**Registered trademark*

Inside Protection with a Flair

How? E. J. Brach & Sons, Chicago, use Rhinelander's board-lining chocolate Glassine paper. Package designers found that, when Rhinelander Glassine is laminated to box board, chocolate oils can't seep through, messy staining is prevented, and the candy contents keep their appetizing Come-Hither-ness.

Brach finds Rhinelander Glassine tops for other candy packaging jobs, such as fluted bonbon cups and candy trays.

Among its other advantages, Rhinelander Glassine is low in price and handles with remarkable ease on high speed automatic packaging machines.

If your quality product needs maximum protection . . . *with a flair* that entices sales . . . look into economical Rhinelander Glassine or Greaseproof papers. And a range of attractive colors can complement the appearance of the product. *Write today* for more information and samples, stating your application.

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Packaging Is Everybody's Concern

By Robert Giljohann
American Viscose Corp., Film Div.

What are you doing about your company's packaging? Right here I can hear you saying, "Hey! Stop! Just what have I got to do with this packaging bit?" Well, let's use the five "W's" of packaging, Who, Why, What, Where, and When and delve further.

Who should be concerned about candy packaging? Everybody! That's who; from the president right on down to the shipping room personnel. Everyone along the line should be made aware that what he or she does contributes a great deal toward the final finished package.

Why is this so? The package is the "face of the manufacturer," a "lone eagle" on the shelf during, as one person put it, a "7 second, 7 day, 7 week sell." Today, the total packaging business is around $17 billion dollars a year. The United States Department of Commerce, for the "60's", predicts that the value of packaging will be up 59%. That is a healthy chunk of money, enough for you to be concerned about.

What is going to bring about this large increase in packaging? There are various economic factors involved in this. 32% of the people recently surveyed in the candy industry indicate that a growing population will help. The Department of Commerce says that population can be expected to rise 17% in the next ten years. 25% of the group said that expanded markets would contribute. Did you know that there will be 21% more households by 1970; 20% of the people will be over sixty; the teenage group will increase about 15%; and that working wives will go up from eighteen million to twenty-four million?

Where do we go from here? 20% of the candy group surveyed expect a change in the 1960 distribution pattern; an increase to chains and supermarkets was most mentioned. I also believe that this is so, not that there won't be other outlets, such as vending machines and retail stores, but it is the prime one.

When should you start thinking about the road ahead in packaging? Right now, of course. 50% of all purchases in the market today are unplanned, compared to 38% ten years ago. 86% of all purchasers like to see what they are going to buy, especially those unplanned purchases. These unplanned purchases are largely *candy, gum,* snack items (pop corn, potato chips), frozen foods, and baked goods. The shopper sees 200 articles every minute that she shops. "Each week three times as many people see the package on the shelf as read *Life Magazine.* Every week the package on a supermarket shelf is seen by four times as many people as read the *Readers' Digest.* Week after week, almost as many people continue to see the package as see the most spectacular of spectaculars on TV," so says the Director of the Folding Paper Box Association, G. L. Nordstrom. Is she sure of seeing yours? The best package test yet devised is: "Does the housewife buy it?" Will she buy yours?

How can you be sure that she will help you increase your profits as some in the industry expect for the "60's?"

Here are some ideas which could help you. If you don't recall one word of this talk, but come up with one idea that will help you, then I will feel that I have been successful.

Instant candy

Sure, no preparation necessary, no messy pots to wash, bite-size, easy to eat, instant energy and lots of food value. Along with this, you should make your package easy for the consumer to use. Does it invite her to pick it up because it is convenient? Here's a cereal package—tear open top. Here's one with a pour spout. Cigar packages and other boxes have tear strips. It makes those hard-to-open packages you hear your wife talk about easier to get into. Remember, that those working wives are going to increase, and want as much convenience built in as possible.

Multi-packs

The six bar pack for 25¢ or so—these are standard in the industry and everyone takes them for granted. Have you looked at yours or investigated the possible production of one? Look what Good & Plenty did.

Portion-packs

Have you ever thought of selling institutions, restaurants, or airlines on candy with the meal—that instant candy? The cracker people put up portion packs. Why can't more candy be served this way? Portion-packs would be good for harried mothers for school lunches. Why not increase the range and scope of those items already packaged this way?

Fractional-packs

Eat one part now—put the rest in the freezer or store it! If it's in a bag or overwrap, it can be done. Packages such as marshmallows, potato chips, and cracker boxes, along with twin loaves of bread, are examples of this.

Showcase-packs

Here's one—Hudson Tissue. Here's another—Chiffon Tissue. Nice, aren't they? Do you have one around your house? How do they fit in with candy, you say? Why not a nice tray, paperboard or plastic, which when the outer printed wrap is removed becomes a candy dish ready to use on the table at parties or when the bridge club meets?

Bundling

This is where retail units are wrapped in wholesale lots for redistribution. Here is a packaging technique that can be used to good advantage in many places, especially for replacing chipboard cartons—a good way to help reduce costs in the "60's."

Now, running through my head I keep hearing, "I don't know anything about packaging materials." Well, the industry abounds with information on packaging materials. I'm working, now, on an ASTM Committee which is trying to gather information on films in order to further help you evaluate packaging materials for your products.

Here is Easy Lesson No. 1 which may help.

There are three major functions which a packaging material must fulfill:

Selling the package
Protecting the package
Economical fabrication of the package

Remember, I mentioned the "7 second, 7 day, 7 week sell;" 7 seconds when the consumer looks at the package, selling every day, 7 days a week, and 7 weeks in the distribution pipeline. Your design must attract attention, but fade into the background when the product is picked up. Whether it be printed box or tray, or printed overwrap, the important thing is: "Will it make the consumer want to pick it up and buy it?"

Protection for that seven-week period of distribution, which some claim is the average, is a matter then for the packaging material. Here is a chart which will give you a start in picking out the packaging material best suited for your needs.

Harmful Effects	Protective Properties Needed
Light	Opacity
Lack of visibility	Transparency
Humidity	WVT resistance
Dehydration	WVT resistance
Flavor loss (e.g., essential oils of high volatility)	Gasproofness
Fat of oil penetration	Greaseproofness
Odor contamination	Gasproofness
Poor machinability	Flexibility & freedom from static
Damage from crushing	Rigidity of package
Lack of toughness	Tensile & flexural strength

The properties of the most common films used in the industry today are listed below.

Packaging for tomorrow's market should be the concern of everybody. Be sure to include yourself.

Aluminum Foil

Foil is used as a direct wrap for chewing gum, candy bars, chocolate and many other items. It is completely greaseproof, odorless, tasteless, entirely non-toxic and has excellent moisture vapor resistance. It is often used in very thin gauges—e.g. (.00035"). Foil is dimensionally stable, lightproof, and completely gas resistant in the heavier gauges. It is claimed to reflect radiant heat. As a result of its "dead fold" characteristics, foil can be folded, molded, formed and crimped easily, and it ages well. The limitation of its low tear strength is usually overcome by combining it with other materials. Uncoated aluminum foil will not heat seal. Foil provides many protective qualities, has considerable package appeal, and can be printed by all commercial processes. The use of foil overwraps for candy cartons is increasing, since foil combines an attractive printing surface with excellent moisture protection.

Polyethylene

Doubtless the fastest growing film is polyethylene, a clear translucent or semi-transparent flexible, tough thermoplastic that is free of odors, tasteless, non-toxic and chemically inert. Polyethylene contains no plasticizer, therefore no plasticizer migration can occur. This film will not dry out or embrittle and will remain tough and flexible during prolonged storage. It pos-

sesses excellent low temperature durability, is waterproof and has no tendency to stick to itself.

Because of its low density it has a very high area factor which is about 20,000 sq. in. per pound for 1-1/2 mil gauge. Polyethylene has good tensile strength, tear resistance and puncture resistance—all important to the structural strength of a package. These properties are retained to a high degree over a wide temperature range.

Polyethylene has an average WVT rate of approximately 1.4 grams/100 sq. in./24 hrs. for film of 1 mil gauge (General Foods method 100°F.). Generally in its most popular 1-1/2 mil gauge polyethylene has water vapor transmission rates quite similar to moistureproof cellophane. It is interesting to note that an inverse proportionality exists between the WVT rate and the film gauge. Typical values of water vapor transmission for this film are:

1.4 GRAMS FOR 1 MIL GAUGE
.7 GRAMS FOR 2 MIL GAUGE
.38 GRAMS FOR 4 MIL GAUGE

Polyethylene is being used successfully on automatic bag machines and on filling equipment. It is possible to print polyethylene commercially by flexographic, letter press or rotogravure methods. Polyethylene is widely used as a carton and drum lining material for bulk storage or for packaged storage of seasonal candies. It is principally used in the form of bags fabricated from rolls or tubing, but is now being used as an overwrapping material. Because of their strength, poly bags have found particular acceptance in packaging for supermarkets where consumer packages receive considerable handling. The application of polyethylene to the candy industry has produced some fine packages for such products as hard candies, marshmallows, gum drops and circus peanut type confections.

Polyethylene has a relatively high gas transmission rate and is quite permeable to organic vapors, essential oils and related materials. A similar inverse proportionality of gas permeability to film gauge exists as the one discussed earlier relating to water vapor transmission. This thermoplastic will soften at about 110°C. and while critical in range, can be heat sealed by a number of methods, ranging from the common heated bar sealer through hot wire, impulse, rotating band, heated roller to flame sealing and electronic techniques.

Pliofilm (rubber hydrochloride)

Pliofilm was one of the earliest thermoplastic films which could be heat sealed to provide a weld-type bond. It is available in a variety of formulations, but is not widely used in the candy industry. Pliofilm has a favorable yield factor, good folding endurance and can be used for stretch wrapping. Also it possesses a low rate of water vapor permeability.

Cellulose Acetate

Cellulose acetate is comparatively little used as either a direct candy wrap or a carton overwrap. Because of its excellent dimensional stability it is ideally suited for box windows. Window boxes have made steady gains in the confectionery industry. In its heavier gauges this film is used for the fabrication of rigid transparent containers for counter display of bulk candy as well as for packaging of the higher priced specialties. While cellulose acetate can be used in vacuum forming, it is not a moisture-proof film. Its permeability to gases is high, and it is somewhat critical to seal by heat alone. It is available in case and extruded film, and in the heavier gauges it is usually known as sheeting.

Saran Wrap (polyvinylidene chloride)

Saran Wrap is one of the newer thermoplastic films to enter the candy industry, with a number of converters now fabricating fine bags from this material. Several machine manufacturers are now utilizing electronic sealing equipment for this film. Saran has long been known for having the lowest rate of water vapor transmission of any of the transparent films used in packaging, as well as for its strength, dimensional stability, resistance to chemical action, low gas permeability and good aging characteristics. It has been somewhat restricted in application because of its relatively high cost, special heat sealing requirements and inability to handle with ease on high speed packaging equipment.

Polymer-Coated Cellophane

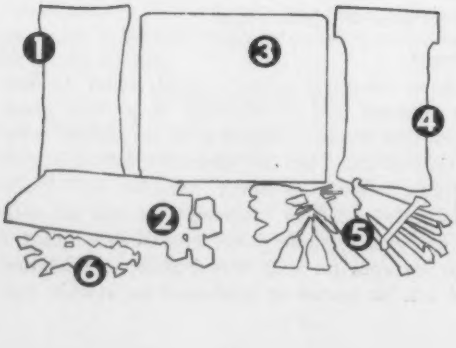
Polymer-coated cellophane combines some of the best properties of saran film with the most desirable qualities of cellophane, thereby overcoming some of the limitations of each material. In this case, polyvinylidene co-polymers are used as a thin coating. This film has excellent clarity and prints well by any method. Its machine handling properties are excellent and there are fewer break-throughs at the corners of the package, often a source of potential trouble. Its WVT rate is at least as low as that of good lacquer-coated cellophane, and one great advantage of this film is its resistance to puckering and wrinkling. Also its grease resistance is excellent. Often this film can be used in the 450 weight in place of a duplex bag.

Polymer-coated cellophane has been recommended for marshmallows and other types of candy where a single wall construction of lacquer-coated cellophane provides adequate durability, but insufficient protection. Prolonged exposure to extreme conditions or to unusual product ingredients will not result in a coating breakdown, neither is this coating susceptible to abrasion due to hard, scratchy products. In many cases, saran-coated cellophane is used for its appearance factors. Sugary products benefit from saran coating's immunity to attack by sugars, preventing degradation of moisture protection during shelf life. Smoothness and clarity add to the quality impression of the product packaged in this film.

Glassine Papers

This basic wrapping material meets many packaging requirements and is available in a wide range of finishes and weights—differing in properties, color, clarity, opacity and gloss. In the candy industry, glassine is often used as a direct wrap on bar goods, and sometimes as a liner. This material can be made greaseproof, water vapor proof, heat sealable, and is available in types for high speed machine operation. Glassine can be coated or laminated by a wide vari-

6 different pack
6 different Du P



1. Candy bag: "K"* cellophane, an exceptionally strong, moistureproof, polymer-coated cellophane that offers excellent appearance, superior flavor retention and top machine efficiency.

2. Soft candy direct wrap: MD-36, a cellophane that prevents candy from sticking to wrapper, possesses good flexibility and durability.

3. Overwrap: MSD-54, a cellophane possessing good durability and flexibility. Moistureproofness and heat-sealing properties are good for overwraps, bundling.

4. Extra-strong bags: "K" cellophane, type 600, the most durable cellophane ever offered candy makers. This polymer-coated film is superior in strength, appearance, flavor protection, rigidity.

5. Direct wrap for pops, sticks, etc.: MSD-53, a tough, flexible cellophane for a tight, puncture-resistant wrap that can take a beating.

6. Twist wrap: MD-35, a cellophane with high flexibility for tighter wraps, high machinability for top-speed efficiency. Prevents piece-to-piece sticking.

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nt cellophanes

... and every one has the selling power of clean, clear transparency!

No two types of Du Pont cellophane are alike. They can be as different as the types of candy they were designed to package. Whatever your candy packaging need, there's a Du Pont cellophane tailored to do the job . . . to pay off in more profitable packaging for you.

Du Pont cellophanes offer candy packagers:

- *clean, clear transparency*
- *excellent flavor retention*
- *high-speed machine efficiency*
- *excellent printability*

Look to Du Pont for "What's New" in packaging films, ideas, services. See how crystal-clear Du Pont cellophanes (like new, extra-tough "K"* cellophane, type 600) can help you package efficiently, profitably.

Ask your Du Pont Representative or Authorized Converter for additional information about Du Pont's over 100 *special* types of cellophane. He'll be glad to work with you to evaluate your specific needs. Or write: Du Pont Co., Film Department, Wilmington 98, Delaware.

**Du Pont trademark*

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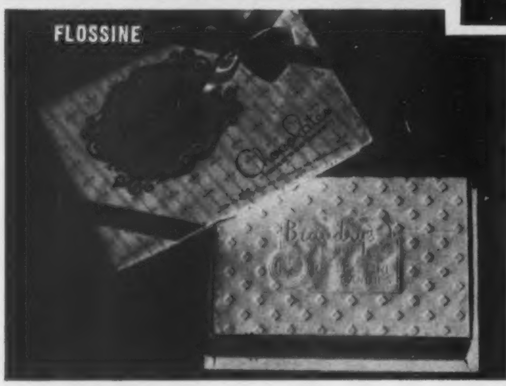

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ety of methods or formulations. Wax laminated types of glassine have good flexibility and can be molded.

Waxed Papers

Several grades of sulphite papers and glassine are the most widely used base stocks of waxed papers. Waxed papers provide good product protection at relatively low cost. The base material used in most coating formulations is paraffin wax. Higher seal strength, greater moistureproofness and improved low temperature flexibility can be obtained through additives such as polyethylene and microcrystalline waxes, which give hard finish, high gloss and scuff resistance to the coating. Waxed papers are odorless, tasteless and non-toxic. They can be printed by different methods and lend themselves to operation on automatic packaging machines.

Laminated Structures

These structures offer tremendous possibilities for the future, since several of the most desirable protective properties not usually found in a single film can be incorporated in a lamination.

In this category we find:

The *cellophane to cellophane* lamination, offering outstanding protection and strength plus rigidity for better display. Wrinkling is practically absent. This type of lamination allows sandwiching of the printing between the film layers, thereby protecting the print. No contamination by printing inks is possible. Depending on the laminants used, the WVT rate can be substantially lowered and the bursting strength increased.

Cellophane-saran laminations are now available for the nitrogen packaging of nut meats. While the candy industry has done little inert gas or vacuum packaging with flexible packaging materials, these two methods are being introduced in other branches of the food industry. Thus far, certain laminations have proven themselves in this field, while the development of suitable equipment has been slow.

Cellophane-polyethylene laminations are similar to cellophane-cellophane laminations. However, still greater strength is obtained in this combination. Reverse printed cellophane offers an excellent scuff-proof printing surface and the poly member of the lamination offers permanent strength.

Foil-wax-tissue candy bar wrappers make very effective packaging.

Reverse printed *cellulose acetate laminated to paper* is well suited for candy boxes where outstanding beauty is the only requirement.

Cellophane

Cellophane is a protective, low-cost, transparent film, lending itself to trouble-free operation on high speed wrapping machines or packaging equipment, because of its complete freedom from static electrical charge. It is the most versatile transparent film because the base film can be varied in plasticizer content, plasticizer type and gram weight. Different types of cellophane are designated by code symbols, which are descriptive of film properties. Film thickness (gauge) is expressed as 300 (lightweight), 450 (intermediate), and 600 (heavyweight),—these designations roughly refer to weight area relationship in approximate decigrams per square meter. The area factor varies from 11,600 square inches to 21,500 square inches per pound, depending upon gauge and type.

All types of cellophane have a grain, an orientation known as "machine direction" or traversely "cross machine direction". All types are inherently greaseproof, have a very low permeability to dry gases, and a variable and higher permeability to moist gases. Cellophane is insectproof, as far as non-boring insects are concerned, and it can be considered bacteria-proof. Its flammability compares to that of newsprint, sunlight has practically no effect on its performance. Its transparency is well-known, as is the fact that certain types are available in a wide range of colors.

Coatings can be formulated to make cellophane water vaporproof, i.e. either highly moistureproof or semi-moistureproof, and heat sealing or non-heat sealing. In fact, the tenacity or strength of the heat seal bond can be controlled by these coatings. Cellophane may be heat sealed by passing the two or more film surfaces to be sealed under pressure over a heated surface, thereby causing a "fluxed" state of the thermoplastic coating. On cooling, the coating solidifies rapidly, forming a solid bond between the film surfaces.

The dimensional stability of cellophane depends on storage conditions—ideal storage calls for approximately 70°F. with 40 to 45 per cent relative humidity. While under proper storage conditions, deterioration due to age is negligible. Warehouse storage beyond ninety days is not recommended. Its cold, or low, temperature durability depends on type of film, plasticizer, and water content. Uncoated cellophane has a high water vapor transmission rate, whereas coated films have a very low WVT rate. Cellophane's resistance to strong acids or strong alkalis is poor; it is insoluble to organic solvents. Its area per pound varies with gauge and type. Since its strength and flexibility depend on a definite moisture content, adverse conditions of storage or use make it subject to embrittlement.

Cellophane is used in the candy industry in four principal forms—as a direct wrap for bar goods, individual pieces, twist wraps, etc.; as a box, tray or boat overwrap; in single wall or duplex-constructed bags formed on consumer bag-making or filling machines; and in pre-fabricated or converter-made bags.

New Packages

Bonomo-Korday have introduced a line of true fruit filled individually wrapped hard candies. They are bagged in saran, with multi-colored header labels. This item is designed, both as to quality and packaging, on European candies, in an effort to recapture some of the market that has been taken by imported candies.

Necco is the first to use metalized glassine for candy wrapping, on this new package for their five cent

mint pattie. This type of wrap combines the advantages of glassine, with the sales appeal of printed foil.

Bunte has introduced coconut bon bons, in a new vacuum formed poly vinyl tray. The filled tray is overwrapped in K film with a header label.

Planters have introduced salted-in-the-shell peanuts in three sizes of cellophane bags. The sizes are 10¢, 7 and 12 ounces, and are considered as a snack item.

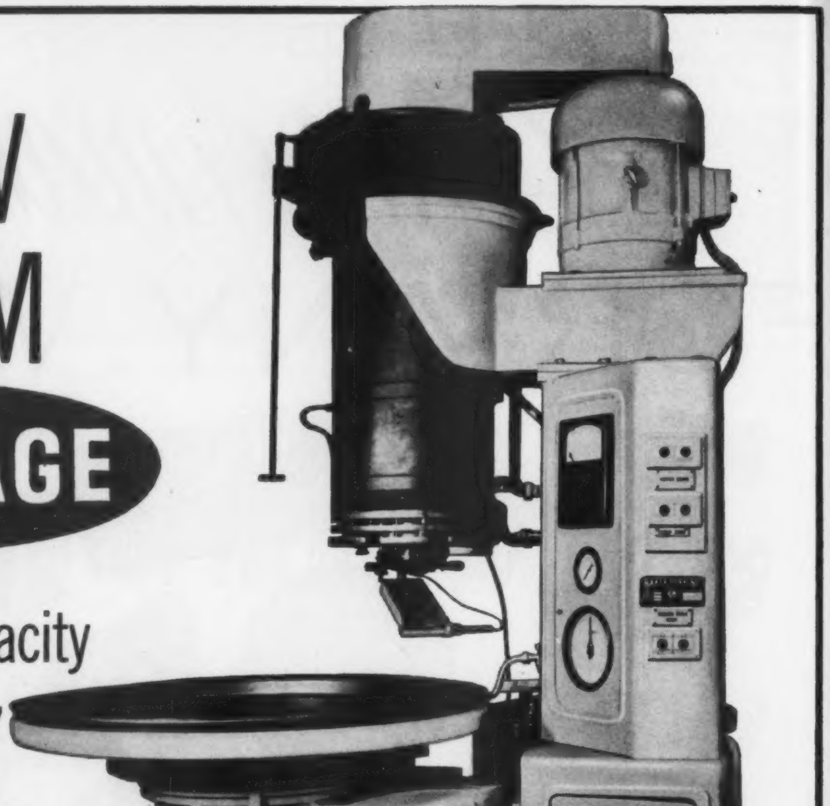
Topps is introducing a five cent package of bubble gum cigarettes. They hold six individually wrapped cigarettes, and the packages are modeled after a standard cigarette pack.

Hollywood has put their new bar, All Star, together with two other regular ten cent bars into a three bar display carton, containing 36 bars. All three bars have foil wraps.

NEW FROM

PACKAGE

Large-Capacity "Microfilm" Continuous Cooker



Now, continuous, automatic—almost instantaneous—cooking of candy in large quantities is possible with the Baker Perkins 27JB cooker. This new Microfilm atmospheric pressure cooker is a compact, high-speed machine. It was designed to produce a higher-quality, more uniform batch than possible with a vacuum cooker. Cooking capacity of a 60 sugar-40 corn formula is well over 2,000 pounds per hour.

A high-speed rotor with centrifugally-loaded blades spreads the syrup in a very thin film on the steam-heated surfaces of the evaporator. The batch cools almost instantly on the patented cooling table, is easy to work and of the highest possible quality. Under normal operating conditions, it takes just 8 seconds, at 320°F, for the syrup to pass through the Microfilm evaporator.

The Microfilm will handle all standard sugar-corn syrup formulas, and is especially effective with those in which the corn syrup is replaced entirely by sugar. A large-capacity Baker Perkins Sugar Dissolver is available to handle the large capacities needed by the Microfilm cooker.

For the candy manufacturer who is looking for the best continuous-cooker, combining quality control with large capacity, the Baker Perkins Microfilm cooker is the answer. Take advantage of Package Machinery's 15 years of servicing the candy industry with top quality, dependable candymaking and wrapping machines. Call your Package representative today for complete information on the Baker Perkins candymaking machines.

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NEWSMAKERS

Paul L. Frederick, manager of the southern district of the Du Pont Film Department's Packaging Sales Division has been appointed assistant manager of converter sales. Mr. Frederick has been associated with the Film Department for 10 years.

Raymond F. Myers is elected to the newly created post of Vice-President in charge of Manufacturing and Transportation of Refined Syrups & Sugars, Inc.

Lance A. Wise has been appointed assistant public relations director of the A. E. Staley Manufacturing Co. and editor of the Staley Journal.

Dr. Harold W. Schultz, Head of the Department of Food and Dairy Technology at Oregon State College, Corvallis, has been named President-Elect of the Institute of Food Technologists.

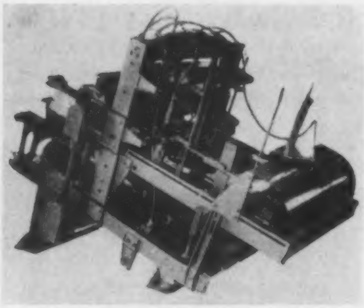
E. A. Sanstrom, manager of manufacturing and engineering at the Walter Baker operation in Dorchester, has been appointed to the newly created post of manager, manufacturing services. Named to succeed Mr. Sanstrom is **R. Eugene Mohlie,** who has been with G. F.'s Post division in Battle Creek, Mich., since 1949.

Angus J. Gardner has been named vice president for marketing of the Packaging Division, Olin Mathieson Chemical Corporation. He was formerly vice president in charge of sales for Rice Barton Corporation, Worcester, Mass.

Charles P. McCormick, Jr., of Baltimore, has been elected President of the Flavoring Extract Manufacturers' Association, succeeding **E. N. Heinz, Jr.,** of Chicago, Illinois.

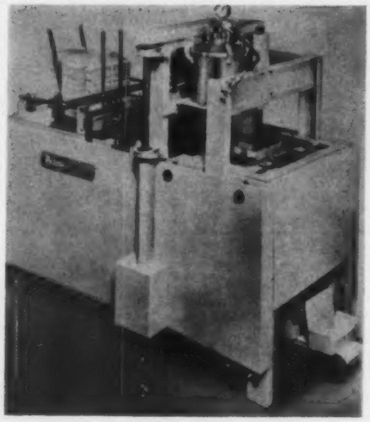
William A. Damerel of Farmington, Conn. has been appointed Director of Purchases for the Package Machinery Co.

New Products



A mechanical case opener has been developed that operates up to 40 cases per minute, and is efficient at all ranges of speed. It receives knocked-down corrugated shipping cases, opens them and positions them over the funnel of a packer, then discharges them to the infeed of a gluer and sealer.

For further information write; Crompton & Knowles Packaging Corp., Holyoke, Massachusetts.



A new tray and carton former has been developed for converting low cost blanks into cartons and trays at speeds up to 70 per minute. This machine was developed for installations where moderate speed and cost were primary considerations. The machine features a closed glue system which allows the machine to operate instantly after starting, without any warmup period.

For further information write; Peters Machinery Corp., 4700 N. Ravenswood Ave., Chicago 40, Illinois.

A high speed weigher has been developed that will provide up to 70 weighings per minute, at an accuracy of 1/20 ounce. The weighing operation takes place in eight scales, fitted into a rotary head. The motion is continuous, with filling, checkweighing, trimming and dumping taking place without interruption.

For further information write; The Olafsson Corporation, Lansing, Michigan.

CANDY PACKAGING AND MARKETING

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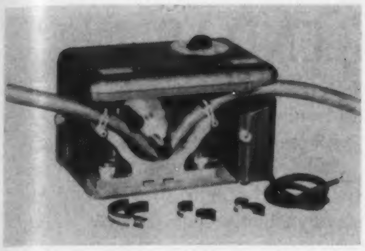


A new flow induction pump has been developed based on the principle of moving compressions along a flexible hose. The pump moves liquids, slurries, gases, dried powders, etc. None of the materials touches metal parts in the pump, but only pass through the flexible hose which may be of several materials. The motor is steplessly variable, up to 200 rpm. It is self-priming, even when dry, can be run dry without damage, will hold considerable vacuum, and is completely sterilizable.

For further information write; Schueler & Company, 75 Cliff St., New York 38, N. Y.

Low temperature sealing cellophane has been developed that will allow higher machine speeds. This new type of film allows full strength heat seals at temperatures 50° lower than required on standard types of film, yet it retains all the superior properties of the former type of high yield film.

For further information write; E. I. du Pont de Nemours & Co., Wilmington, Delaware.

A new water-system latex form of polyvinylidene chloride resin has been developed for use as a coating material which imparts outstanding barrier and protective properties. This new material can be applied at low cost to a variety of porous and nonporous substrates by standard coating equipment. Among these properties is the coatings extreme resistance to transmission of water vapor and common gases.

Among possible confectionery uses is its application as a coating on corrugated for bulk shipping cases for hard candy, marshmallow goods, etc. Another use could be a coating for pouch paper for nitrogen packs of nut meats.

For fact sheets on this new resin, write; National Starch and Chemical Corporation, 750 Third Avenue, New York 17, New York.

A roll wrapping machine has been developed to assemble individual shell molded chocolates and wrap them in a foil inner wrap and a paper outer wrap. Up to thirty pieces can be wrapped into one roll, with an output of 45 to 50 rolls per minute.

For further information write; James C. Hale Company, 282 Seventh St., San Francisco, Calif.

Release agent data sheet has been prepared to provide technical information on the use of this type of product. All ingredients in this product have been cleared for food use by the FDA.

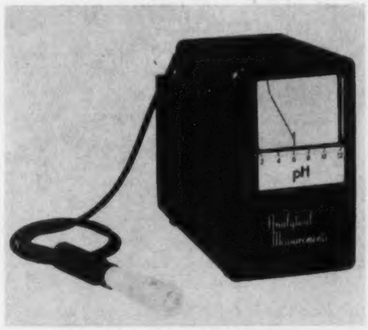
For a copy write; W. A. Cleary Corp., New Brunswick, N. J.

Easily cleaned wire mesh belts have been developed especially for the food industry. This new feature is built into a belt by welding the ends of individual spirals and connecting rods back onto themselves. This method of construction allows each component of the belt to separate completely when the belt is slack, thus allowing a cleaning solution to completely reach every part of each component.

For further information write; The Cambridge Wire Cloth Company, Cambridge, Maryland.

Impulse Sealing Equipment has been developed for use with polyethylene. A rapid heating effect is achieved by pulsing a thin ribbon of high temperature alloy with a high current for a short time interval. After the heating current is cut off, the extremely low thermal capacity of the alloy ribbon results in an effective reversal of heat flow, and a resultant rapid cooling action. Though designed primarily for polyethylene sealing, these units will do an equally fine job on such films as saran and vinyl.

For further information write; Weldotron Corp., 841 Frelinghuysen Ave., Newark, 12, N. J.



A continuous recording pH meter has been developed for process control. It utilizes an electronically modulated amplifier that compensates for line voltage fluctuations and uses standard radio tubes. A strip chart recorder forms the front panel of the instrument and contains 62 feet of chart paper. It will last for up to 31 days at the rate of 1 inch per hour. It provides a unitary glass electrode system completely protected by polyethylene which makes possible pH monitoring. It lists at $195.

For further information write; Analytical measurements, Inc., 585 Main St., Chatham, N. J.

Blommer
CHOCOLATE
COCOA
THE BLOMMER CHOCOLATE CO.
FACTORIES: LOS ANGELES
CHICAGO, SAN FRANCISCO

New Broker Appointments

The annual Directory of Candy Brokers lists several hundred candy brokers and the manufacturers they represent. Listed below are recent changes showing the manufacturers and the newly appointed broker.

ABC Popcorn Co., Chicago, Ill.
Harry Rich, Chicago, Ill.

Annabelle Candy, San Francisco, Calif.
J. W. Podmore, Honolulu, Hawaii

Barg & Foster, Milwaukee, Wisc.
James Peterson, Oakland, Calif.

Blue Jay Food Prod.,
Newman & Weissman, Brooklyn, N.Y.

E. J. Brach (Specialties Div.), Chicago, Ill.
Niven & Niven, Dunedin, Fla.

Breakers Confections, Chicago, Ill.
James Peterson, Oakland, Calif.

Edith Cavell Candies, Chicago, Ill.
B. F. Proudlock, Chicago, Ill.

D. L. Clark, Pittsburgh, Pa.
Bratton-Rodems Co., Buffalo, N.Y.

Cracker Jack Co., Chicago, Ill.
Morrie Golick, New York, N.Y.
E. Skinner, Chicago, Ill.

Frank H. Fleer, Philadelphia, Pa.
English & Mac Isaac, Royal Oak, Mich.

Fresh Pak Candy, Moline, Ill.
C. G. Williams, Oswego, N.Y.

Fox Cross Candy, Everett, Mass.
Charles P. Tucker, Shreveport, La.

Handy Pax, Roxbury, Mass.
Edward A. Berg & Sons, Teaneck, N.J.

Dewitt P. Henry, Philadelphia, Pa.
Bratton-Rodems Co., Buffalo, N.Y.

F. M. Hoyt & Co., Amesbury, Mass.
Clarence W. Mann, Rochester, N.Y.

Jan Boon Chocolate, Holland
A. S. Jaffe, San Francisco, Calif.

Ernest E. Johnson Co., Chicago, Ill.
W. J. Brogan, Denver, Colo.
Hy Falkowitz, Syracuse, N.Y.
David Levin, Phoenix, Ariz.
Northwest Brokerage, Seattle, Wash.
Robert S. Snitger, Philadelphia, Pa.

King Candy Co., Fort Worth, Texas
Fred G. Johnson, El Paso, Texas

Peanut Specialty Co., Chicago, Ill.
Frank S. Schulz, Louisville, Ky.

Pops Galore, Dallas, Texas
Lloyd N. Pelky, Sherman Oaks, Calif.

Sifers Valomilk, Kansas City, Mo.
McCracken & Hewitt, Denver, Colo.

Spangler Candy, Bryan, Ohio
C. G. Williams, Oswego, N.Y.

Vernell-Thompson Candy, Seattle, Wash.
E. Skinner, Chicago, Ill.

Victoria Sweets, Babylon, N.Y.
H. V. Schechter, Forest Hills, N.Y.

W & F Manufacturing, Buffalo, N.Y.
McCracken & Hewitt, Denver, Colo.

W. H. Weatherly Co., Elizabeth City, N.C.
Charles F. Stork, Lancaster, Pa.

The 1960 Directory of Candy Brokers, classified by the territories covered by the brokers, is included in The Candy Buyers' Directory and is available at the publishing office for $5 per copy.

CALENDAR

June 5-9; Associated Retail Confectioners, convention, Philadelphia, Pennsylvania.

June 5-9; National Confectioners Association, 77th annual convention, Philadelphia, Pennsylvania.

June 6; Denver Mile Hi Candy Club, breakfast meeting, 7:30 A.M., Denver Athletic Club, Denver, Colo.

June 9-12; New York Candy Club & Metropolitan Candy Brokers Assn., 5th annual candy show, Trade Show Building, New York City.

June 10; Los Angeles Confectionery Sales Club, 12:00 noon meeting, Roger Young Auditorium, L. A.

June 11; Carolina Confectionery Salesmen's Club, luncheon meeting, S&W Cafeteria, Charlotte, N. C.

June 11; Kansas City Candy Club, luncheon meeting, Town House Hotel, Kansas City, Kansas.

June 20; Confectionery Salesmens' Club of Philadelphia, 1:30 P.M. meeting, 2601 Parkway, Philadelphia 30, Pennsylvania.

June 23; Confectionery Salesmen's Club of Baltimore, stag outing, Turf Valley Club, Ellicott City, Md.

June 25; Southwestern Candy Salesmens' Club, luncheon meeting, Sammy's Oak Lawn Restaurant, Dallas, Texas.

June 25; Gopher Candy Club, luncheon meeting 12:30 P.M., Normandy Hotel, Minneapolis, Minn.

July 1; St. Louis Candy Sales Association, 7:30 P.M. Meeting, Congress Hotel, St. Louis, Mo.

July 10-13; SWTCA, convention, Dinkler Plaza Hotel, Atlanta, Ga.

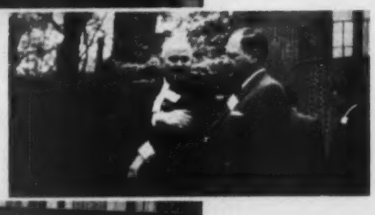
July 21; Empire State Candy Club, clam bake, Hinerwadel's Grove, North Syracuse, New York.

July 30-August 4, NCWA, 1960 convention, Sheraton-Park Hotel, Washington, D. C.

July 30; August 3; 4th Annual International Specialty Food and Confection Show, Congress Hotel, Chicago, Illinois.

September 4-6; 3rd Annual International Confectionery Show, Parc des Expositions, Paris, France.

Production Conferees: Dr. Katheryn Langwill, Refined Syrups and Sugars, and Prudence Allured, The Manufacturing Confectioner.



Production Conferees: Hans Dresel, chairman of the Conference, and Mark Heidelberger.

Production Conferees: Charles Campbell, Laura Secord, and Howard Gage, Burrell Belting.

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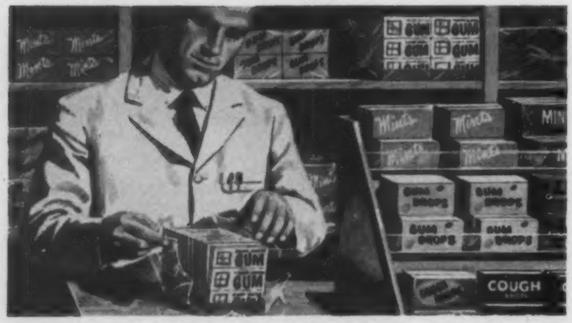
CHERRIES
CHOCOLATE
CHERRIES
COVERED

How bundling fraction-of-case units with Avisco® cellophane can help your retailers



Retailers benefit in many ways when they receive fraction-of-case units of your product bundled in Avisco cellophane. This modern packaging film offers many time-saving and sales-building advantages over the paper wraps and boxes traditionally used for this purpose.

Cellophane enables retailers to use bundles as shelf displays without unwrapping. Bundles of a product can be conveniently stored next to individual packages remaining on the shelf. Retailers can see at a glance how much stock they have and what needs to be ordered. Cellophane bundling also facilitates mass displays during special promotions. In some instances it has even helped retailers sell entire bundled quantities to consumers.

Not only does the transparency of cellophane reveal the full impact of your consumer package—but its sparkle adds dramatic sales appeal. What's more, cellophane is unmatched when retention of freshness is essential. It controls air and moisture and keeps products free from dust. As a matter of fact, people everywhere have come to associate cellophane with freshness and cleanliness.

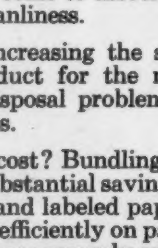
In addition to increasing the shelf life and sales appeal of a product for the retailer, cellophane eliminates the disposal problem caused by bulky cartons and wraps.

What about the cost? Bundling with Avisco cellophane can offer substantial savings. It eliminates the need for printed and labeled paper wraps or boxes; operates fast and efficiently on packaging machines; seals easier and more securely with heat. And cellophane substantially reduces packaging material inventory and the storage space it requires.

Cellophane bundling also becomes an extra selling tool for you during special promotions. For example, you can use printed cellophane to explain deals and display ideas to your retailers.

We offer a complete packaging service to assist you, and demonstrate how Avisco cellophane, plain or printed, will answer your bundling requirements better and more economically than any other material. Phone or write us for an appointment with our representative in your area or a selected cellophane converter specializing in your field.

Learn more about cellophane bundling. Send for this FREE handbook—"Cellophane Bundling . . . newest concept in distribution packaging."



AVISCO

AMERICAN VISCOSE CORPORATION, FILM DIVISION, 1617 PENNSYLVANIA BOULEVARD, PHILADELPHIA 3, PENNSYLVANIA

Continued from page 46

at that temperature for a suitable time. This is not practical, for it probably would require several weeks. It is also clear that the same temper can be maintained for some time, if the temperature is high enough so as to intersect the melting curve at a point corresponding to a very low solid-content. In this case no new nuclei can appear and no growth of existant crystals can take place beyond a certain limit corresponding to the equilibrium. Such a temperature would presumably correspond to 1-3% solid-content and be very near to 34° C (93.2° F) for ordinary chocolate mix. Stirring is of course always necessary to prevent settling of solid particles, but in this case it must not be intense.

4) Under a given set of circumstances the tempering temperature must be adapted to the nature of the fat and to the fat content of the mix. Even if pure cacao butter is the only fat present, a variation of 1° C (1.8° F) may be necessary, according to the melting characteristics of the cacao butter. Milk chocolate should be tempered some 2° C (3.6° F) below sweet chocolate, as can be seen from Fig. 14 which shows that for the upper melting range the melting curves differ by that amount. Chocolate to which Borneo tallow or a hardened fat has been added may require a higher tempering temperature than usual. Because of the influence of solid liquid interfaces, the tempering temperature must be raised when the fat content is lowered. At the same time the mixing intensity must be increased, in order to promote the dispersion of the crystal seeds, which becomes more difficult with high solid contents.

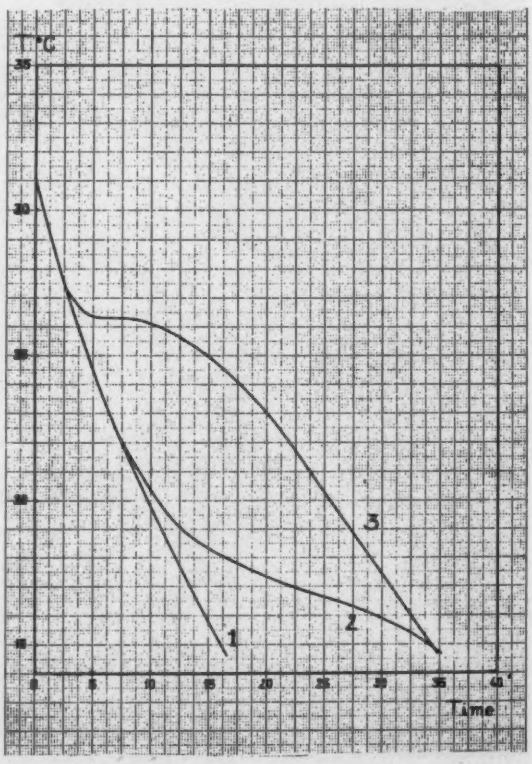


Fig. 20. Cooling curves of (1) Paraffin oil (2) Untempered chocolate (3) Properly tempered chocolate.

5) Contrary to a widespread belief, when properly tempered chocolate is cooled after molding or enrobing, the cacao butter solidifies initially in the β'-form, but the transformation in the β-form starts at once. After travelling through a cooling tunnel in air at 7° C (44.5° F), for something like half an hour, the temperature at the center of the bar will have fallen below 15° C (59° F). At that time all of the cacao butter will be solid, and about one half will be in the stable β-form, the rest in the β'-form. The transformation in the β-form is completed within the next half hour after the chocolate has left the cooling tunnel.

With untempered chocolate the cacao butter crystallizes in the α-form, and this is partially transformed in the β'-form during cooling. After this chocolate has left the cooling tunnel the transformation in the β'-form is quickly completed, but the transformation in the β-form takes several days and it produces very severe bloom.

This explanation is founded upon consideration of cooling curves of tempered and untempered chocolate. With different cooling conditions in the apparatus, different curves are obtained, as can be seen from Fig. 15. For practical purposes, we use an apparatus similar to the one employed for the calorimetric investigation of cacao butter, but the sample is larger (1.5 g), it is contained in a light (3 g) aluminum cylinder, and the glass cylinder which acts as an air jacket is immersed in ice water coolant. Under these conditions the cooling rate is similar to the one observed in a cooling tunnel under practical conditions, and the curves obtained give valuable information on the degree of temper. Nearly the same method was used by Sachsse and Rosenstein (34). Fig. 20 shows the cooling curves of (1) paraffin oil (2) untempered and (3) properly tempered sweet chocolate (27% fat). It can be seen that with untempered chocolate, heat is evolved from 22° C (71.5° F) onward, but especially between 18-15° C (64.5-59° F). This could be due to direct crystallization of the β'-form, but upon heating the sample from 15° C (59° F) it was found that the melting heat of 22 cal./g for the cacao butter corresponded to a mixture of α- and β'-form. When a sample of the untempered chocolate was moulded, it was covered with bloom after one day at room temperature. With tempered chocolate, heat is evolved at 26.5° C (79.5° F) which is near the mid-melting point of the β'-form. After cooling to 15° C (59° F), a heating curve shows that the melting heat is 32 cal/g, so that at that point the cacao butter must be a mixture of the β- and β'-form in equal proportions. When the sample is reheated to room temperature, the transformation into the β-form is complete

after half an hour. A bar moulded from the tempered chocolate remained free from bloom. We must conclude that the aim of tempering is to promote the rapid crystallization of the cacao butter in the stable β-form, but crystallization in the β'-form is an intermediate step which cannot be avoided. This is due to the fact that during cooling practically no new stable nuclei are formed, while the growth rate of the existing ones is insufficiently rapid to effect the complete transformation in less than an hour. Even this can only be achieved if the chocolate is properly tempered, which means that a large number of stable nuclei must be preformed probably much more than one million per ml.

6) The chocolate being properly tempered, the cooling rate is not very critical; it may be very fast or rather slow, provided the final temperature reached lies below the beginning of the melting range of the stable form, i.e. 20° C (68° F). Centers coated with a thin layer of chocolate can be cooled in air at 18° C (64.5° F) whereas solid chocolate bars require a lower temperature in order not to lengthen the cooling process unduly. The temperature of the centers should be say under 28° C (82.5° F) in order not to destroy the temper of the chocolate through melting of part of the nuclei.

7) As already stated, two kinds of fat bloom can be distinguished. That due to incorrect tempering appears rapidly, producing a general whitening of the surface and a granular structure of the interior. This is due to the formation of crevices between the large crystals of the β-form, the slow formation of which is accompanied by a contraction of slightly more than 1%. These crevices are filled with air and scatter the incident light, giving a white appearance to the surface. In a certain sense one could say that in this case the bloom lies under the surface. Fig. 21 illustrates this point. With properly tempered chocolate the crystals are so small that no visible fissures appear between them (Fig. 22).

On the other hand, fat bloom due to partial melting during storage, can produce crystals which grow on the surface of the chocolate from liquid droplets. These droplets are squeezed to the surface through the existing pores.

8) From the foregoing it could be concluded that it is impossible to destroy the temper of chocolate by overtempering. When tempering below 33.5° C (92.3° F) the only result of tempering for too long a time would be to make the chocolate too viscous for molding or enrobing, because the number and the size of the crystals become too large. At a slightly higher temperature one would expect the temper to be maintained indefinitely. However, it is possible that prolonged tempering at these temperatures could actually reduce the number of nuclei present through growth of the larger

Fig. 21. Appearance of surface of untempered cacao butter after solidification and storage for several days. Magnif 75 X

Fig. 22. Appearance of surface of tempered cacao butter under the same conditions. Magnif. 75 X

ones and disappearance of the smaller, or through a shift in the glyceride distribution in the crystals.

9) Explanations of the formation of fat bloom based on the assumption that transformation of a less stable to a more stable gives off enough heat to melt part of the cacao butter are not correct. Even the fairly rapid $\alpha \rightarrow \beta'$ transformation produces a temperature elevation in a chocolate bar of not more than 1° C (1.8° F), as shown in Fig. 18.

10) Foreign fats which lower the melting range of cacao butter such as almond and nut oils, promote the formation of fat bloom, which becomes possible at lower storage temperatures. Milk fat is an exception. This is probably due to the fact that in the presence of this fat the stable β-crystals have much less tendency to form large crystals, but tend to remain in a microcrystalline shape.

11) Foreign fats which shift the melting range of cacao butter to higher temperatures, will generally reduce the blooming tendency. However, a careful investigation of the whole melting curve is necessary before it is possible to make conclusions, A mere elevation of the final melting point is not sufficient. The influence of the foreign fat on the crystalline structure and on the nucleation rate should also be considered.

12) Accelerated stability tests in which temperatures over 25° C (77° F) are reached, are useful for investigating the influence of various additions upon the stability of high temperature resistant chocolates. They give misleading results when used for evaluating the degree of temper of ordinary chocolate.

F) Recent Advances

In the foregoing a summary of our work on cacao butter has been presented. Since the appearance of our main publications, much more studies on cacao butter have been undertaken than in all the time up to then. Three main centers of activity have developed, namely in the United States, in Germany and in England.

It is impossible to review all that has been published. However, two points which are relevant to our conclusions deserve a short discussion.

It has been shown by different authors (11), (6) that fat bloom has a higher melting point and a lower iodine value than the cacao butter from which it is derived. This is not difficult to understand for coatings which contain a proportion of nut oils of high iodine value, because the separated crystals will be composed of nearly pure cacao butter. Even when cacao butter is the only fat present, a slow crystallization may be expected to produce crystals of a somewhat higher melting point than normal. This results from the fact that solid cacao butter is a solid solution of different glycerides. Normal cooling always produces a solid which is not in thermodynamical equilibrium. Very slow cooling, as well as slow transformation from one form into the other, will permit the formation of crystals containing a larger part of high-melting glycerides, compared with the surrounding fat.

Secondly, an ingenious theory has been proposed by German workers (4), according to which fat bloom is not due to the crystallization of β-crystals, but to the existence of a solubility gap in the prase diagram of the solid cacao butter. At a temperature near the melting point the glyceride mixture forms a stable solid solution. When the temperature is lowered, two solid phases will separate, the one with the higher melting point corresponding to the crystals of fat bloom.

We believe that this theory is not correct. It is well known, as Fincke pointed out long ago (15), that the complete melting point of cacao butter can show a slight rise over a period of years, and this may be due to a gradual separation of crystals containing a higher proportion of saturated glycerides. This happens also when seeded cacao butter is kept for several hours at 32°C (89.5°F) (44).

However, it is clear that fat bloom is not due to such a phase separation. For in that case bloom could only appear if the storage temperature falls below a certain point (15°C or 59°F according to the published diagram) which is manifestly wrong. The arguments advanced in favor of the "solubility gap" theory do not withstand close sçrutiny. The main argument is that even perfectly tempered chocolate can show fat bloom during storage at room temperature. But room temperature is a very vague term, and it can include temperatures very much in excess of 20°C (68°F) which corresponds to the beginning of the melting range of the stable form. There is no difficulty in explaining the formation of bloom in this case. In fact our investigations have shown that two conditions must be fulfilled for the appearance of fat bloom on perfectly tempered sweet chocolate: 1) the temperature must vary continuously; if it remained absolutely constant, no bloom could ever appear. 2) It must occasionally rise above 20°C (68°F) (or perhaps 15°C (59°F) according to the dilatometric curve) so that at least a small part of the solid cacao butter can melt. If the storage temperature remains always very low, no bloom appears, as the German investigators must concede.

On the other hand the "solubility gap" theory cannot explain: 1) Why only crystals of the phase with the higher melting point should grow on the surface of the chocolate. 2) Why untempered chocolate rapidly shows severe bloom even at low temperatures.

Even though this theory must be rejected, it shows that there is still room for further improvement of our knowledge on cacao butter and fat bloom.

References

(1) Albers, D., Chem. Weekblad, **25,** 235 (1928)
(2) Bailey, A. E., and Singleton, W. S., Oil and Soap **22,** 265 (1945)
(3) Bailey, A. E., Melting and Solidification of Fats, Interscience Publ. Inc., New York 1950
(4) Becker, K., Fette, Seifen, Anstrichmittel, 59, 636 (1957)
(5) Bushell, W. J., and Hilditch, T. P., J. Soc. Chem. Ind., **57,** 447 (1938)
(6) Cerbulis, J., Clay C., and Mack, C. H., J. Am. Oil Chemists' Soc., **34,** 533 (1957)

(7) Chapman, D., J. Chem. Soc., 2715 (1957)
(8) Chapman, D., Crossley, A., and Davis, A. C., J. Chem. Soc., 1502 (1957)
(9) Daubert, B. F. and Clarke, T. H., J. Am. Chem. Soc., **66,** 690 (1944)
(10) Duffy, P., Liebigs Annalen, 84, 291 (1952); J. Chem. Soc., **5,** 197 (1853)
(11) Easton, N. R., and Moler, E. S. Jr., Zucker-und Suesswaren-Wirtschaft, **7,** 261 (1954)
(12) Efremov, N. N., Ann. Inst. Polytechn. Oural, **6,** 155 (1957)
(13) Efremov, N. N., Ravich, G. B., and Vol'nova, V. A., Izvest, Sektora Fiz.-Khim. Anal., Inst. Obshchei i Neorg. Khim., Akad. Nauk S.S.S.R., 16 (No. 3) 142 (1948)
(14) Fincke, H., Z. angew. Chem., **38,** 572 (1925)
(15) Fincke, H., Z. untersuch. Lebensm., **80,** 12 (1940)
(16) Fincke, H., Zucker-und Susswaren-Wirtschaft, **8,** 140 (1955)
(17) Hilditch, T. P., and Stainsby, W. J., J. Soc. Chem. Ind., **55,** 95 T (1936)
(18) Hinton, C. L., Fette, Seifen, Anstrichmittel, **58,** 853 (1956)
(19) Hofgaard, K., "Dilatometriske Fedstof-Undersoegelser" Gads Vorlag, Copenhagen 1938
(20) Kleinert, J., Zucker-und Susswaren-Wirtschaft, **7,** 772 (1954)
(21) Kremann, R., and Schoulz, R., Monatshefte f. Chemie, **33,** 1063 (1912)
(22) Lutton, E. S., J. Am. Chem. Soc., **73,** 5595 (1951)
(23) Lutton, E. S., J. Am. Oil Chemists' Soc., **34,** 521 (1957)
(24) Lutton, E. S., and Jackson, F. L., J. Am. Chem. Soc., **72,** 3254 (1950)
(25) Malkin, T., and Meara, M. L., J. Chem. Soc., 103 (1939)
(26) Malkin, T., and Wilson, B. R., J. Chem. Soc., 369 (1949)
(27) Meara, M. L., J. Chem. Soc., 2154 (1949)
(28) Neville, H. A., Easton, R. N., and Bartron, L. R., Food Technol., **4,** 439 (1950)
(29) Pichard, M., Compt. rend., **176,** 1224 (1923)
(30) Pichard, M., Bull. official office inter. cacao chocolat, **1,** 1 (1931); **2,** 23 (1932); **2,** 29 (1932); **7,** 333 (1937); **9,** 367 (1939)
(31) Quimby, O. T., J. Am. Chem. Soc., **72,** 5064, (1950)
(32) Ralston, A. W., "Fatty Acids and their Derivatives" John Wiley & Sons, Inc., New York 1948
(33) Reinders, W., Doppler, Ch. L., and Oberg, E. L., Rec. trav. chim. **51,** 917 (1932)
(34) Sachsse, M., and Rosenstein, J., Fette und Seifen, **55,** 122, (1953)
(35) Schnack, V. J., Ingenioeren, **52** (No. 31) 40 (1943)
(36) Straub, J., and Malotaux, R. N. M. A., Chem. Weekblad, **26,** 596, (1929)
(37) Straub, J., and Malotaux, R. N. M. A., Rec. trav. chim., **52,** 275 (1933)
(38) Straub, J., and Malotaux, R. N. M. A., Rec. trav. chim., **57,** 789 (1938)
(39) Vaeck, S. V., VIIe Congress Internat. Industries Agricoles (Brussels 1950) vol. **4,** p. 104
(40) Vaeck, S. V., Internat. Chocolate Review, **6,** 100 (1951)
(41) Vaeck, S. V., ibid. **6,** 350 (1951)
(42) Vaeck, S. V., ibid. **7,** 323 (1952)
(43) Vaeck, S. V., ibid. **10,** 14 (1955)
(44) Vaeck, S. V., Zucker-und Susswaren-Wirtschaft, **8,** 718 (1955)
(45) Van Roon, J. D., Chem. Weekblad. **26,** 619 (1929)
(46) Van Roon, J. D., Chem. Weekblad, **27,** 498 (1930)
(47) Vivario, R., Congres Internat. Fabricants Chocolat et Cacao (Antwerp 1930) Preparat. vol., p. 171
(48) Welmans, P., Pharm. Ztg., **45,** 959 (1900)
(49) Whymper, R., and Bradley, A., J. Soc. Chem. Ind., **44,** 77 T (1925)

Interpack Fair Report

By Stanley E. Allured
Editor

The second Interpack Fair, held in Dusseldorf, from April 20 to 27, proved to be the largest display of candy, chocolate and wrapping machinery and materials held anywhere in the world. This Fair was first held in 1958, and resulted from a desire to pull this important segment of industrial display out of the gigantic Hanover Fair, and build it as an important Fair in itself.

The result of this split has certainly been a boon to the confectionery industry for here, in about 500,000 square feet of displays, were collected all of the equipment for our industry that is made in all of Europe. Only a few Americans visited the first Interpack, but this year the word seemed to have gotten around, for there were probably forty or fifty candy manufacturers from this country there. As further evidence of the importance of this affair, nearly every confectionery machinery sales and manufacturing organization of this country was represented there.

Even considering the greatly increased attendance by American candy manufacturers, it is still remarkable how many large manufacturers did not see fit to view this Fair. Given an opportunity to see the latest designs of some thirty machinery manufacturers, and to talk to the engineering staffs of these firms about the new concepts in candy production, it is hard to see how any company could fail to realize a value many times the cost of $1,000 or less that a trip to this Fair would cost.

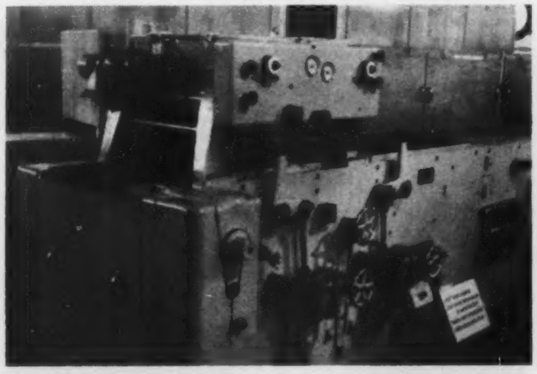
A report on some of the more unusual and interesting machines follows below. Bear in mind, though, that these few machines we describe in this report represent no more than one in fifty of those actually on display.

Buss AG

The Buss Ko-Kneter, displayed on this stand, is

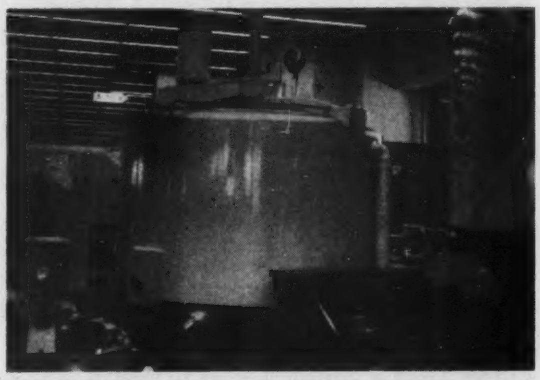
G. Steinberg

This firm showed a unique spray-coating machine. The hood is fitted with several chocolate spraying heads, and the wire band carries the goods through under the sprays. While this is coating bakery items, it seems that it might have some application to the confectionery field.



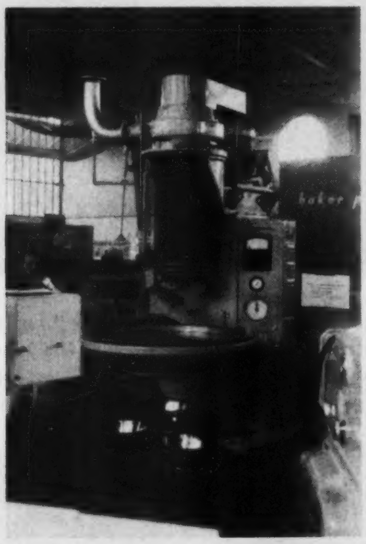
Wrinkler & Dunnebier

This is a depositor that will deposit two different types of materials through the same nozzle. The most interesting application is the depositing of a center within a chocolate shell, making a completed chocolate coated piece in one operation. Some samples, run on this machine, indicated that under certain conditions this can be done satisfactorily.



J. S. Petzholdt

This Petzholdt conche, which has become quite familiar to Americans, has enjoyed a considerable amount of success in this country. Its unique aerating action together with an effective mixing and "slapping" effect, seem to give the chocolate just the proper combination of treatment.



Baker Perkins (Exports)

This is a new large size of the firm's Microfilm cooker. It is a thin-film continuous cooker, of 1,000 pounds per hour capacity, and will handle a 100% sugar hard candy. In addition to hard candy, most any type of candy syrup can be cooked on this machine. Just below the cooker, is a water cooled slowly revolving table. A batch is collected and cooled on this table, then taken away in batches.

Rovema-verpackungsmaschinen

This firm showed a form, fill, seal bag machine, but with a new wrinkle. Instead of the sealing bars pulling the tube through the machine, as is common with most such machines, a set of four rollers, set against the tube, push it down. The result is that the machine will make a gusset type bag, that is practically square when filled and which will stand up on a flat base.

Nielsen Equipment

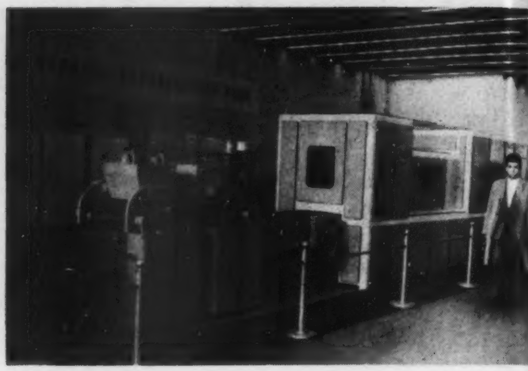
This is a line up of small and medium size melting and tempering kettles. They are of polished aluminum, with integral drives and thermostatically controlled. This firm also showed their chocolate coating machines.

Wilhelm Rasch

The most interest at this stand was in a variety of foiling machines. One was operating on foiling two half eggs into a whole egg. The two halves were hand fed into position on a plate, and the machine then foils them together. Another machine was foiling rectangular pieces at 120 per minute, with an automatic feed.

Mikrovaerk A/S

This machine, on display at the Interpack, is a shell making plant. It is a speciality operation, making only a chocolate shell, for later filling with individual pieces. Also on display was the Ericksen forming plant for making chocolate centers for panning.



Gebr. Bindler

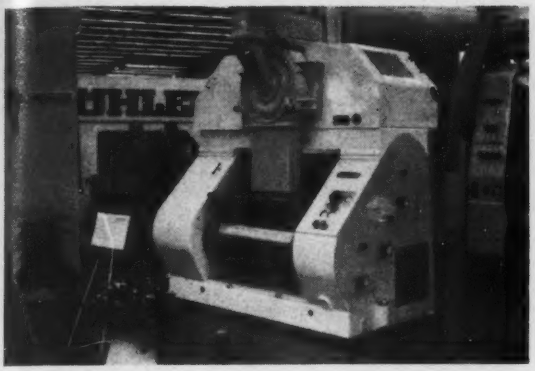
This firm displayed a complete chocolate shell molding plant. It is of the loose mold type, and able to produce nearly any type of molded product. Two types of depositors were included, one of the conventional type for depositing fluid centers, and a new type for the depositing of very stiff centers, almost an extruder.

Kreuter & Co.

This is a large chocolate coating machine with a radiant cooling tunnel. Other firms showed equipment with this type of cooling applied, though we could not determine to what extent it is in use in factories.

Hermann Bauermeister

This firm, in conjunction with Fred S. Carver Company of the U. S., has developed this cocoa press for sale throughout the world. In addition to this ten-pot machine, other capacities are also built.

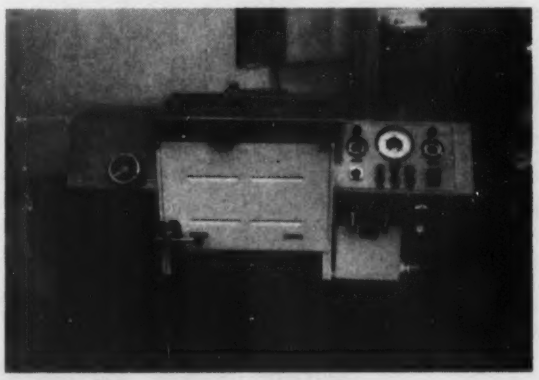


Gebruder Buhler

This is a three roll nib mill, quite common in Europe for grinding the nib and reduction to a fine paste. This type of mill, though of lower capacity than the specialized nib grinders, does the job at a much lower temperature, which tends to provide a better flavored chocolate.

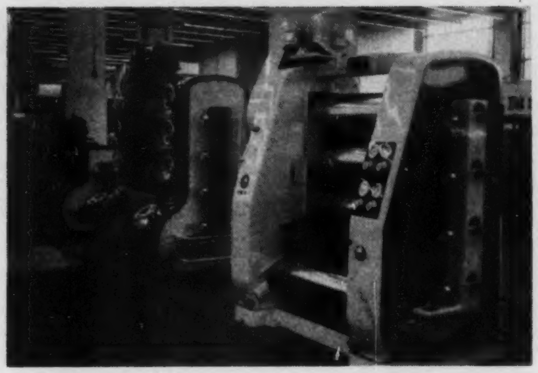
Carle & Montanari S.p.A.

On a large stand that included many types of machines, this firm showed this loose mold type shell molding plant. It is adaptable to nearly any type of molding process, hollow, filled and solid.



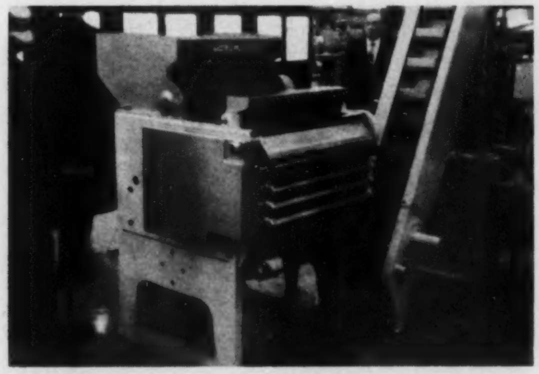
Sollich KG

The Sollich tempering machine, manufactured in a range of capacities, is one of the most popular in Europe. It is based on the high-speed thin film principle, and can be used in conjunction with any type of chocolate using equipment.



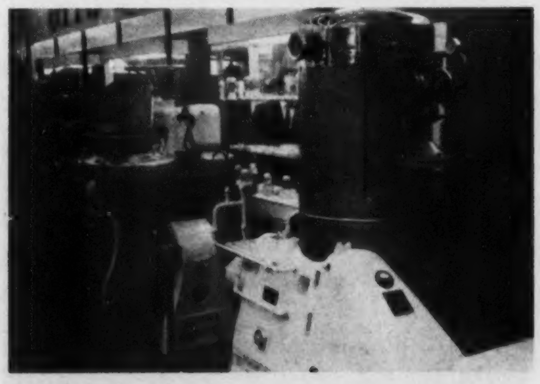
Thouet KG

This line up of roller refiners illustrates the variety available for different type of work. The nearest is a hydraulic control model, the next is a manual control model, and the third is a three roll nib mill.



Hamac-Hansella Maschinen GmbH

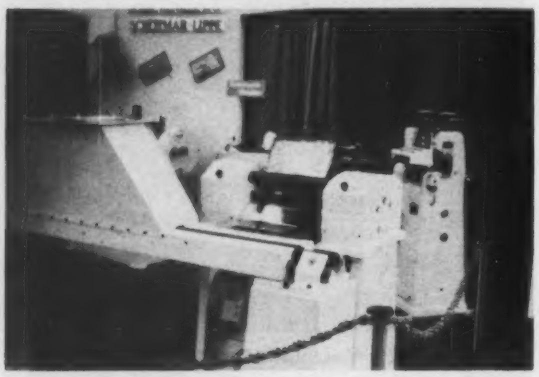
This is a new counter introduced by Hansella. It works in conjunction with a bucket elevator and bag making and closing machine. The counter provides a positive count of individually wrapped hard candies, and places them into a single bucket for a single package.



Otto Hansel Junior

This continuous vacuum cook fondant machine performs all operations automatically. From the precook kettle, the syrup is pumped through a steam dome, through a cooling tube and then through a beater. It is the only type of fondant machine operating in this manner.

a continuous mixing machine. Its unique properties allow it to take a liquid, cool and mix, and extrude the resultant paste. On the stand it was fitted with automatic feeding equipment, which would feed a dry material at a constant weight per hour. This machine is quite common in the more automatic chocolate plants in Europe.

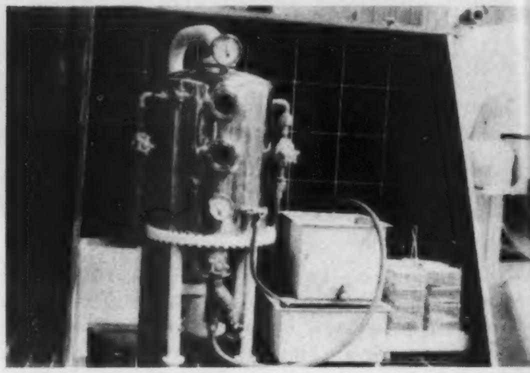


Hema-Maschinenbau

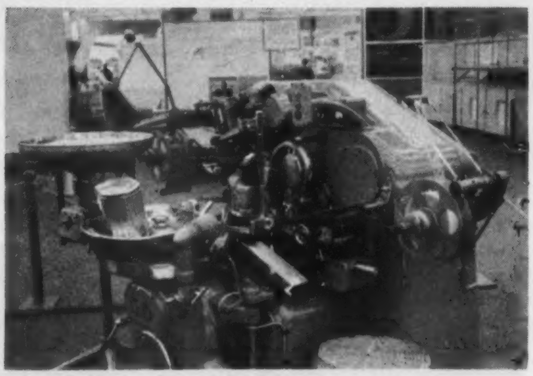
This firm has developed a unique cutter for inlaid hard candy. A section of rope, brought down to size, is fed through the cutter which slices through almost to the middle, without disturbing the pattern. The rope then goes through a cooler, and the individual slices can then be broken apart cleanly. For pops, these slices are put through a radiant heating chamber, and into a machine that drives a stick into each one.

Gebr. Ter Braak

This continuous vacuum cooker breaks vacuum automatically, through the use of a timing mechanism. The kettles swing around, to continue the vacuum cycle, automatically by the weight of the candy. It is a cleanly designed machine, uncomplicated in operation.



This is a model of a crystallizing set-up. The large tank precooks the syrup under vacuum, and drains into the crystalizing tanks. A built-in refractometer is a sure check on the correct baume of the syrup. Syrup is returned to the tank, and additional sugar added automatically. The cook is done by steam coils in the tank, and these same coils, circulating cold water, cools the syrup to the desired temperature for crystalizing. This is a unique set-up, the most efficient that we have seen. The intriguing thing about this tank is that it might very well operate exceptionally well as a master mix and dissolving tank for nearly any type of candy.

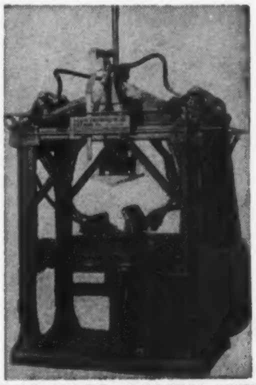


G. D. Bologna

This machine has become quite common in Europe. It bunch-wraps square hard candies in cellophane, then gathers them in packets of up to fifteen. This complete cycle is automatic, and operates at speeds of about 400 individual pieces per minute.

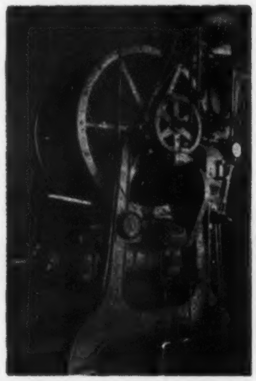
Production Conferees: Howard Vair, Vair-E-Best, F. Rose, Cantab Industries, and Bob Giljohann, American Viscose.


NEW INGREDIENTS FOR NEW
AND
IMPROVED FOOD PRODUCTS



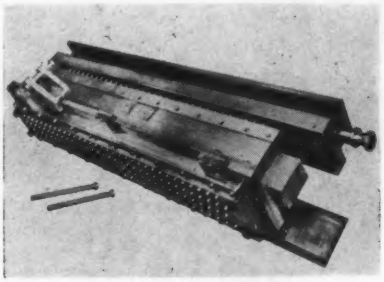
BERKS HARD CANDY MIXER

- Handles sugar direct from Cooker, 80 to 150 lb. batches
- Uniformly incorporates Color, flavor and acid
- Mixes at rate up to 1000 # /hr.
- Up to 10% scrap may be included



Hohberger Continuous Cream Machine

- Up to 2,000 lbs/hour
- No pre-cooking kettles necessary, if liquid sugar is available
- For straight sugar or any amount of corn syrup
- New design reduces elevation to 10½ ft.



Mill River Pump

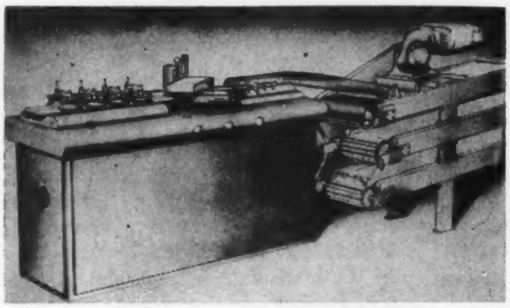
Accommodating Offset Impressions

(Bausman-built)

- Water-sealed Pump Bars for all depositors
- Precision-built from finest materials
- Offset or staggered impressions accommodated
- Special multi-row construction incorporates changeable nozzle plate

THE HOFFMAN CLUSTER MACHINE

- Handles all free-flowing nuts.
- 2 more clusters per row
- All stainless steel construction
- Available in 16-24-32 and 40 inch widths, for use with enrobers.

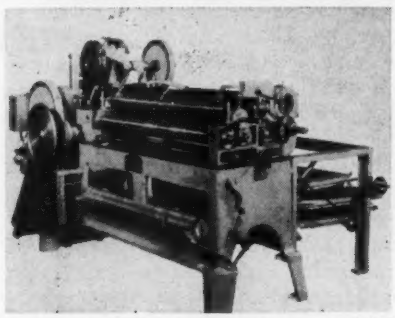


M.F.P. STICK-MASTER

(Patent Pending)

Integrated Sizer & Twister with electronic speed control.
Flexible — Diameters for ¼" to 1½"; length from 4" to 16".
Productive — up to 1500 inches per minute.
Sanitary — Stainless steel finish — Candy always in sight.

HOHBERGER BALL MACHINE



Only one operator required to produce up to 1,200 lbs. per hour.
You can produce:
Balls—clear, pulled or honeycombed filled—9/16" to 1½" diameter.
Sunbeam Starlights, stripes brought down to center without expensive inlay.

Representative: *John Sheffman, Inc.*

152 West 42 Street **New York 36, N.Y.**

By A. E. Abrahamson
Dept. of Health, New York City

Do we get machine construction suitable to our sanitary needs?

I regard it a pleasure to renew my acquaintance with you and to have this opportunity to report to you my observations as a Public Health Sanitarian on certain of the "goings on" in your industry as well as in others in the food field. Lest you be taken in by this promise, let me add that this is not going to be a gossipy talk but one which will attempt to measure progress as seen from my own field of observation and interest: sanitation.

Following the amendment of the Food, Drug and Cosmetic Act in 1938 and the announcement by the Federal Food and Drug Administration of its program to promote clean food production, it became apparent that the improvement of food machines to facilitate and assure sanitation was a basic need.

Since that time and for about twenty years the Department of Health of the City of New York has fostered a comprehensive program aimed at achieving better machine design and construction to further sanitation maintenance in food processing establishments. This program has stimulated a great deal of interest in the food industry which, to a degree, produced a similar reaction in food machine manufacturing circles. This interest, which was shown by the machine fabricators and which was generated by the machine using groups such as yours, was based upon the awareness of the contributions to product cleanliness by improvements both in sanitary design and in construction of processing machinery.

On May 24, 1944 representatives of a cross section of the candy industry of the City of New York held a meeting in the Department of Health of that city to which their members, confectionery machine manufacturers, metal fabricators and suppliers were invited. The requirements of the Department of Health were outlined. A discussion followed aimed at establishing objectives and developing a program for the eventual construction of sanitary machines which would meet these requirements. Mr. Charles Adelson presided, as chairman of the N.C.A. Equipment Division of the Post War Planning Committee.

With the demands of the war there followed a shortage of materials and the impetus which was generated by this initial step of the industry soon petered out. Unlike the equipment follow-up in other food industries, this program in the candy industry did not become deep rooted.

This brings me to the subject "Do We Get Machine Construction In the Candy Industry Suitable to Our Sanitary Needs?" The answer to this is, "essentially no." As a consequence of the failure to continue industry interest in machine sanitation improvement, we may still find many machines in most any plants which are not of sanitary design and construction and which offer considerable resistance to sanitary maintenance.

I need not tell you that sanitation has a cost in manpower and materials. Sanitation is something which we, in this country, regard as a "way of life". Because it is one of our basic principles, we are willing to pay for its preservation and for its furtherance.

In periods of business adversity we sometimes are tempted to back away from principle, for reasons of practical economies. You in the food industry generally resist this temptation because you have a strong feeling of your responsibility to your customer. Therefore, careful consideration of this problem must lead to the inevitable and logical conclusion that you must have sanitation but you must have it at the lowest possible cost. There is no authentic information to show the dollars and cents saving resulting from improvements following the installation of machines which are easier to clean. Yet, all who own machinery that is of sanitary design and construction are satisfied that they are getting better cleaning, and it is being obtained with greater facility. It then follows that this greater facility although it may not be measured dollarwise can be less costly.

I do not want, in this short period, to outline to you a list of those specific confectionery machines which are regarded as of sanitary or insanitary construction, nor do I wish to discuss the broad principles of proper machine design. These are a matter of record and the information is readily available for all those who are interested. My purpose in talking to you today is to recreate the type of interest in this problem which existed some years ago but has aborted. It is my opinion, from the standpoint of ease of machine cleaning, that there is a great need today in this industry for a less complex design of such devices as chocolate enrobers, chocolate melters, fondant machines, depositors, cooling tunnels, starch goods machines,

and special hard candy equipment. There are no established sanitary standards for the construction of these machines which are employed throughout your industry. Your industry must examine the sanitation aspects and evaluate the sanitary construction of other machines which some of you use, such as mills and roasting and frying equipment.

I am convinced that a great deal may be done to improve the sanitary aspects of your machine design. This industry needs a committee or a subsidiary organization which would undertake, with qualified sanitation consultants, to evaluate the sanitary aspects of the existing equipment and then to sit down and write standards for the design and construction of sanitary machines which would embody basic principles. This group could even outline standards of performance. This idea is not new. As an example, the dairy industry has developed such a working organization, made up of the Dairy Industry Committee, the United States Public Health Service and the International Association of Milk and Food Sanitarians, the fruits of whose labors we have all seen. Some of you already use some pieces of equipment which have been designed and constructed in accordance with the standards which this group has developed.

The baking industry is pleased with its efforts in developing sanitation standards for the construction of machines which are employed by bakery operators. Six associations of this industry, namely, American Bakers Association, American Institute of Baking, American Society of Bakery Engineers, Association of Retail Bakers, Bakery Equipment Manufacturers Association and the Biscuit and Cracker Manufacturers Association, have joined forces to form the Baking Industry Sanitation Standards Committee. To date, this committee has written standards for 17 types of bakery equipment. There are also as many in various stages of development. Equipment manufacturers are urged by the using group to construct according to these standards.

The restaurant industry finds that some of its sanitary improvements may be attributed to the construction of equipment according to the sanitation specifications of the National Sanitation Foundation. Other groups such as those established by food vending machine manufacturers, food canners and frozen food packers are also engaged in developing standards for the construction of sanitary machines used in these industries.

There is much in this industry effort which is commendable. This is evidence of responsible industry facing up to its obligations. This is self policing and self improvement. This is the kind of industry action, which if carried out effectively, would obviate the need for governmental control in the same field. Our form of government permits the sovereign states to exercise police power within the state. Theoretically then there now may be 50 different sets of state laws bearing upon the sanitation of food machines. Unless the Federal government preempts the field this could result in a chaotic situation. In the field of machine sanitation inspection, there are already signs which point to such impending difficulties.

In the City of New York we are very conscious of the fact that some of our requirements may be in conflict with the thinking of our counterparts in other areas of the country. A city on the West Coast and one in the mid-west are energetically engaged in the enforcement of sanitation requirements for food machine construction. If there are points of conflict, if a machine is built acceptably to one and not the other, how will they be resolved? If unresolved who will be hurt? We readily subscribe to suitable standards developed on a national basis. These standards need not have official status. A quotation from the new Health Code of the City of New York which became effective October 1, 1959, makes such a provision in the following section:

SECTION 81.33

(b)—"The Board may, from time to time, accept by resolution, the standards of public or private standard-setting agencies as meeting the standards for design and construction . . . ."

Because many food industries have not taken hold of this situation by preparing codes specific for machinery needed in their special fields, general codes have been set up by some regulatory agencies. The unfortunate part of these codes is that they are written in such general terms that they require interpretation. This is frequently so subjective that it creates its own difficulties. While the existing industry codes have not been as specific as they might be, the amount of detail nevertheless, for the specific types of equipment makes these codes quite acceptable. What is even more important is the fact that industry people and equipment manufacturers together help to develop these codes. Thus, better understanding results simply through an educational process. In this way, through such a meeting of minds, many of the problems of misinterpretation are eliminated and decisions can be most objective.

It is my opinion that the candy industry would find the going easier in code development at this time because many pieces of equipment in common use by the various food processing industries have been built to standards of sanitation already formulated by industry working with officialdom.

For instance the baking industry is concluding a set of standards for the construction of sanitary equipment for bulk liquid sweeteners. Upon completion of these standards your industry may have available a completed job which was undertaken by another group with similar objectives. In like manner, other machines have been described and standards have been set which could be adopted by your industry by reference. This would reduce the amount of work an industry committee operating in the interest of manufacturers of candy and confectionery would have to do. There still remains, however, the problem of writing standards for machinery which is unique to your industry. You must examine the sanitation aspects of these machines and evaluate the sanitary construction of each type and then develop suitable standards. Manufacturers of candy who own units of equipment which are not constructed to meet acceptable sanitation standards either pay excessively for proper sanitary control or do not obtain the sanitary level which these good manufacturers seek. These devices are simply not designed to facilitate cleaning. They therefore subject the user to the dangers of food contamination.

I do not want to leave the impression that the few types of equipment which were enumerated previously are the only examples which would come under review. All machine designs should be evaluated and an appropriate standard should be established for each by your industry group. This group should also study standards already available in order to avoid duplication of effort and in order to permit equipment manufacturers to standardize their construction. I also do not wish to imply that there is at this moment a serious sanitary problem in your industry. My evaluation as an outsider looking in, is that you do not get machine construction in many pieces of equipment which are widely used in your industry, which promote your sanitary objectives, namely, clean machines at minimum cost. I think that there is an easier way to sanitation and that this easier way is built into the machine which is properly designed.

I urge you to give careful consideration to this situation, to use to the fullest the available resources and know-how of willing regulatory agencies and to lead your industry into this important and rewarding endeavor. Your sincere efforts in this form of self improvement will soon be recognized as one in the consumers' interest and ultimately will redound to your own interest.

Associated Retail Confectioners of the U.S.

40th Annual Convention-Exhibit

Ben Franklin Hotel—June 5-6-7-8, 1960—Philadelphia

Sunday, June 5

5:30 P.M. to 6:30 P.M. New Member Reception

6:30 P.M. to 7:30 P.M. **Allied Suppliers Joint Cocktail Party & Reception**

7:30 P.M. to Midnight **House of Friendship Buffet Supper Party & Dance**

Monday, June 6

9:30 A.M. to 12:15 P.M. **Grand Opening—40th** Annual Convention—Active Members and Sponsored Guests
"Let's Face the Facts"
Economic analysis of confectionery industry by Leonard Wurzel, Loft Candy Corp., Long Island City, N. Y.
"Consumer Attitudes Toward Candy and Chocolate In Relation To Increased Sales" A report on why people buy confectionery by Dr. Tibor Koeves, Vice President, Institute for Motivational Research, Inc., Croton, N. Y.

12:30 P.M. **Luncheon—Active Members, Guests and Allied Trades**

2:00 P.M. to 4:00 P.M. **ARC Business Session**
"Sixty Solutions for the Sixties"
Panel presentation on specific application of motivational principles to candy selling. David Faurer, Shellenberger's, Inc., Philadelphia, Chairman

4:15 P.M. to 7:00 P.M. **Set Up Candy Clinic of Americas**

7:00 P.M. to 9:00 P.M. **ARC Candy Kitchen**
Formulas and Ingredients
Machinery and Equipment
Production Short Cuts

Tuesday, June 7

10:00 A.M. to 5:00 P.M. **Allied Trades Exhibit**

9:30 A.M. to 1:00 P.M. **"Success in the Sixties"**
A series of panel presentations exploring proven methods of locating more candy buyers. W. Ralph Hopkin, Marquetand's, Inc., Philadelphia, Chairman
"Selling Candy in Shopping Centers"
"Selling Candy Through Supermarkets"
"Will Self-Service Sell More Candy?"
"Do Auxiliary Lines (cards, gifts, foods) Help Sell More Candy?" "It There A Market For Dietetic Candies?"

1:15 P.M. **Luncheon—Active Members, Guests and Allied Trades**

2:00 P.M. **ARC Active Member Business Meeting**

2:30 P.M. **"Report on the Overall Confectionery Industry Public Relations Program"** by Jack Mavrakos, President, Candy Institute

3:00 P.M. **ARC Ladies Tea and Reception**

7:30 P.M. to 8:30 P.M. **Allied Suppliers Joint Cocktail Party & Reception**

8:30 P.M. to Midnight **40th Annual Dinner-Dance**

Wednesday, June 8

10:00 A.M. **Buffet Brunch—Active Members, Guests and Allied Trades**

11:15 A.M. to 3:00 P.M. **"Idea Clinic of the Sixties"** Panel presentation
"Successful Tips For Retailers"
ARC Secretary Sullivan, Moderator
"Candy Clinic of the Sixties"
Displays of candy from all over North America
ARC President Howard Vair, Chairman

THE PROGRAM—77th ANNUAL CONVENTION

of the

NATIONAL CONFECTIONERS ASSOCIATION

The Bellevue-Stratford—Philadelphia Convention Hall

Philadelphia, Pennsylvania

June 5-9, 1960

Sunday, June 5

6:00 p.m. **Sunday Evening Get-together—Reception**

7:30 p.m. **Pennsylvania Dutch Dinner**

Monday, June 6

8:00 a.m. **NCA Golf Tournament**—Manufacturers' Golf and Country Club and Lu Lu Temple Country Club, Oreland, Pa.

8:30 a.m. **Joint Technical Session of the NCA and the AACT**—Convention Hall
Official Opening, by Douglas S. Steinberg
Quality Control For The Small Manufacturer, by Lawrence L. Rowe
The Food Additives Amendment and Labeling Requirements as Applied to Confections, by Michael F. Markel
Discussion Period
Developments on Modified Fats, by R. O. Feuge
Attitudes on Sanitation, by Gerald S. Doolin
Discussion Period

1:00 p.m. **Luncheon**
Presentation of the Stroud Jordan Award

2:30 p.m. **AACT Business Session**

Tuesday, June 7

9:00 a.m. **Official Welcome and Opening of The NCA 77th Annual Convention,** by Douglas S. Steinberg—The Bellevue-Stratford
Merchandising and Selling for the Sixties
How the Candy Industry can get a Greater Share of the Consumer's Dollar, by George T. Sweetser
What the Manufacturer Can Do to Help the Dealer Increase Sales
A panel discussion: Ellis B. Myers, Bernard F. Jameson, Leonard Abel, Roy M. Russell
Question and Answer Period
Presentation of Policy Statements, by L. Robert Hopkins
Science of Executive Management, by Dr. Adrian M. McDonough
Discussion Period, Coordinated by Thomas F. Sharp and Gilbert J. Buettner

12:30 p.m. **Official Luncheon of the NCA 77th Annual Convention**
Address by Earl W. Kintner, Chairman of the Federal Trade Commission

Wednesday, June 8

9:30 a.m. **Business Session**—Convention Hall
Tools and Techniques for Candy Profits, by Dr. John F. Lubin
Discussion Period, Coordinated by Samuel F. Hinkle and Ira W. Minter
Personnel and Scientific Management, by Dr. Robert P. Brecht
Discussion Period, Coordinated by H. Richard Dietrich and Charles A. Smylie
The Confectionery Exposition—Chance of the Year, by D. P. O'Connor

7:45 p.m. **NCA Production Forum**—Convention Hall
The Functional Use of Ingredients
Sugar, by Dr. Katheryn E. Langwill
Corn Syrup, by J. E. Boyle
Whipping Agents—Egg Albumen and Gelatin, by Dr. William F. Collins
Whipping Agents—Vegetable Proteins, by Dr. J. Kenneth Gunther
Milk Products, by Justin J. Alikonis
Fats, by John D. Toll
Coconut, by Max E. Ruehrmund
Chocolate and Confectionery Coatings, by Norman W. Kempf
Flavors and Colors, by Robert H. Pulver
Question and Answer Period

Thursday, June 9

9:30 a.m. **Chocolate 1960—At Home and Abroad**—Convention Hall
The American Chocolate Industry, by Bradshaw Mintener
Address by the Honorable Chief Akin Deko, M.H.A.
Cocoa Beans—Reality and Hope, by Julian Hemphill
Question and Answer Period
Executive Session—NCA active members only
Action on Policy Statements
Adjournment of Convention

8:00 p.m. **Annual NCA Dinner Dance**—Grand Ballroom

Directory of Exhibitors

National Confectioners Association Exhibition
June 5 to 9, 1960
Convention Hall—Philadelphia

Note: The information in the above list was supplied by exhibitors and is complete as of our press time. Bold face listings indicate advertisers in this issue. See our advertisers' index, Page 112, to locate these advertisements which will give information on the exhibits in greater detail.

Ambrosia Chocolate Company, 528 East Highland Avenue, Milwaukee 3, Wisconsin. Booth 509. In Attendance: L. R. Cook, J. J. Tellier, M. K. Woodhouse, W. Lynfoot, Sr., W. Lynfoot, Jr., H. Kirschenbaum, A. Kirschenbaum, A. H. Levitas, J. Key, R. F. Korfhage, J. Wright.

American Chocolate Mould Co., Inc., 173 Lafayette Street, New York 13, New York. Booth 329.

American Maize-Products Company, 250 Park Avenue, New York 17, New York. Booth 426-428. Displaying: corn syrup, Frodex, thin boiling starches. In Attendance: J. B. Melick, C. H. Sanford, Jr., R. L. Lloyd, C. C. Davis, F. J. Wobbekind, H. J. Hammer, J. B. Brouwer, R. H. Jacobsen, J. E. Cable, W. J McKee, E R. Sterbenc, W. E. Carman, J. H. Rogeri, R. L. Milloch.

American Viscose Corporation, Film Division, 1617 Pennsylvania Blvd., Philadelphia 3, Pennsylvania. Booth 502-504. Displaying: the five concepts of candy packaging, Bundling, Multi, Fractional, Portion and Showcase. In Attendance: R. E. Reynolds, T. H. Derby, G. W. Kindt, J. A. Houle, H. G. Alwine, C. E. Guest, R. E. Stryker, B. Vattieri, L. M. Young.

Anheuser-Busch, Inc., 721 Pestalozzi St., St. Louis 18, Missouri. Booth 235. Displaying: corn syrups and corn starches for confectionery industry. In Attendance: Richard F. Amacher, A. H. Luetkemeyer, R. T. Regan, Ray Haffey, Phil Regan, Charles Hopkinson, H. A. Best, Jr., Frank Voyda, A. F. Moeslein, W. J. Simms.

Atlantic Gelatin Division, General Foods Corporation, Hill Street, Woburn, Massachusetts. Booth 430. Displaying: gelatin and pectin. In Attendance: C. H. Watson, Keith M. Baldwin, Arthur F. Tole, William Kent, Harold Ringland, Herbert Travers.

Atlas Powder Company, Wilmington 99, Delaware. Booth 422 and 424. Displaying: Sorbo (Atlas sorbitol solution). In Attendance: G. S. Cripps, J. T. Zolper, W. H. Knightly, A. S. Geisler, C. E. McLaughlin.

Automation Engineering Laboratory, Inc., 84 Commerce Road, Stamford, Connecticut. Booth 328.

Bachman Chocolate Manufacturing Company, Mount Joy, Pennsylvania. Booth 527. Displaying: chocolate coatings, chocolate liquors, cocoa powders. In Attendance: Richard Stark, Alex McGlinchy, Harold Bush, Wilbur Stark, Walter Kansteiner, W. C. Rich.

Franklin Baker Coconut Division, General Foods Corporation, 15th and Bloomfield Streets, Hoboken, New Jersey. Booth 309 and 311. Displaying: Both new as well as conventional coconut products displayed in a tropical setting. In Attendance: R. A. Stringer, G. T. Brown, R. C. Loeffler, J. I. MacDonald, M. E. Ruehrmund.

The Blommer Chocolate Company, 600 West Kinzie Street, Chicago 10, Illinois. Booth 133. Displaying: tempering tubes, chocolate mixing and holding equipment, chocolate coating. In Attendance: Henry Blommer, A. J. Blommer, Bernard J. Blommer, Henry Blommer, Jr., R. W. Dierker.

Blumenthal Bros. Chocolate Co., Philadelphia 37, Pennsylvania. Booth 301. Displaying: chocolate and its new materials. In Attendance: Sam Blumenthal, Larry Blumenthal, Clyde Sternberger, Bob Thurber, Bob Pariente.

Brazil Nut Advertising Fund, 100 Hudson Street, New York 13, New York. Booth 129. Displaying: shelled brazil nuts. In Attendance: T. R. Schoonmaker and Mrs. T. R. Schoonmaker.

Jabez Burns & Sons, Inc., 11th Avenue and 43rd Street, New York 36, New York. Booth 302. Displaying: pictorial display of equipment and Gump Sifter in operation. In Attendance: Bert Hawkins, Del Creighton, Charles Mosier.

Burrell Belting Company, 7501 North St. Louis Avenue, Skokie, Illinois. Booth 331. Displaying: glazed tunnel belts and plaques, endless feed and cooling table belts, Burtek Buna "N" and Neoprene rubber belting, white cotton belting, plain and treated, packing belts, caramel cutting boards, pulley lagging and other association items. In Attendance: James A. Linn, Howard E. Gage, Jere W. Potter, Dale F. Dirkswager.

Cacao Barry Inc., 366 Madison Avenue, New York 17, New York. Booth 520. Displaying: natural and Dutch processed cocoa powders. In Attendance: Paul P. Ashley, Bridg Culley.

California Almond Growers Exchange, P. O. Box 1768, Sacramento 8, California. Booth 208. Displaying: grades and sizes and varieties of California almonds and almond products. In Attendance: Dale Morrison, A. J. Moake, William H. Condley.

Candy Industry and Confectioners Journal, 660 Madison Avenue, New York 21, New York. Booth 217.

Carle & Montanari, Inc., 95 Temple Avenue, Hackensack, New Jersey. Booth 505-507. Displaying: sugar batch kneading machine "KZ", Carle & Montanari, F. B. Lehmann GmbH., cocoa liquor ring mill type 1313. In Attendance: C. A. Mascherin, Ted Merckens.

Fred S. Carver, Inc., One Chatham Road, Summit, New Jersey. Booth 201. Displaying: cocoa presses. In Attendance: William S. Carver.

Cherry-Burrell Corporation, 2400 Sixth Street, S.W., Cedar Rapids, Iowa. Booth 519.

Chocolate Spraying Co., Inc., 2035 West Grand Avenue, Chicago 12, Illinois. Booth 321. Displaying: Latini die pop machine with wrapping attachment, Latini decorator, Latini revolving pan. In Attendance: John E. Latini, Gilbert Holmberg.

W. A. Cleary Corp., box 749, New Brunswick, New Jersey. Booth 523.

Clinton Corn Processing Company, Clinton, Iowa. Booth 517. Displaying: Clintose, starch, corn syrup. In Attendance: H. A. Bendixen, E. C. Alderson, D. R. Reed, W. F. Jackson, Frank L. Hickisch, E. D. Cottral, R. C. Rau, H. C. Nickelsen, George Burns, A. C. Junge, R. H. Jackson, Dana Dowling, Ernest Wigfield, Jr.

Confectionery-Ice Cream World, 99 Hudson Street, New York 13, New York. Booth 410.

The Confectioner, 728 North Jefferson Street, Milwaukee 2, Wisconsin. Booth 225.

Corn Products Sales Company, 9 East 55th Street, New York 22, New York. Booth 421. Displaying: Globe brand corn syrup, Cerelose brand dextrose, Rex brand corn syrup, Hudson River brand starch, Buffalo brand starch, Filbrisk brand coconut oil S-70XX brand hard butters. In Attendance: J. E. Walz, T. C. Clawson, M. D. Mulling, F. C. Hassman, J. M. Krno, J. P. Driscoll, R. W. Bond, G. N. Olson, W. S. Winter, G. W. Matthews, S. W. Roberts, H. J. Heinstadt, Chas. Waters, Andy Jaeger, T. A. Bruce, Dave Bridges, Phil Moreau, H. J. Wolfmeyer, H. Plimpton, A. N. McFarlane, Alex Milmine, R. F. Cohee.

Diamond Match Division, Diamond National Corporation, 102 Greenwich Avenue, Greenwich, Connecticut. Booth 531.

Diamond Walnut Growers, Inc., P. O. Box 1727, Stockton 1, California. Booth 511.

E. I. duPont de Nemours & Co., Inc., Film Department, 10th & Market Streets, Wilmington, Delaware. Booth 108-110. Displaying: cellophane to fit every candy packaging need. In Attendance: H. D. Chickering, J. B. Phillips, R. J. Crowley, N. A. Gow, J. Rolfe, D. H. Howard, H. L. Taylor, J. K. Goundie, W. J. Yerkes.

Durkee Famous Foods, 88-06 Van Wyck Expressway, Jamaica, L. I., New York. Booth 204-206.

Foote & Jenks, Jackson, Michigan. Booth 223. Displaying: flavors. In Attendance: Paul W. Thurson, T. J. Torjusen.

J. W. Greer Company, Wilmington, Massachusetts. Booth 323, 325, 327. Displaying: candy process lines of the future. In Attendance: Don S. Greer, Fred W. Greer, Frank B. Reynolds, James V. Gardner, John J. Gallagher.

Gunther Products, Inc., 701 West 6th Street, Galesburg, Illinois. Booth 126. Displaying: G-400 vegetable whipping agents. In Attendance: Ken Gunther, Bob Gunther, George Poindexter.

Otto Haensel Machine Company, Inc., 60 East 42nd Street, New York 17, New York. Booth 305. Displaying: HPU-Z Universal foil wrapping machine. In Attendance: Immo Franke, William G. Crothers, Charles F. Moulton, Hans Kruse, Luis A. Ortiz, Ralph W. Hauenstein.

Hamilton-Reflectotherm, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pennsylvania. Booth 500.

Hansella Machinery Corporation, Grand and Ruby Avenues, Palisades Park, New Jersey. Booth 100, 101, 103, 105, 202. Displaying: Hansella type 19K/65D/96A filled hard candy line, Hansella type 126C/145A automatic continuous vacuum cooker and premelter, Hansella type 110C high

speed caramel cooker with vacuum, Euromac-Bauermeister type MK500 mixer-kneader, Euromac-Sapal type BN-f high speed foil wrapping machine, Euromac-Helios 32" automatic coating machine, Euromac-Helios chocolate pump, Euromac-Bauermeister-Carver sample pot for new type automatic hydraulic cocoa butter press, Euromac-Bauermeister type Z-12 Masse cleaner. In Attendance: Kurt Beyertz, Joseph L. Raffetto, Jr., C. G. Cockinos, George B. Hislop, Robert H. Fortune, Jack Green, Guenther Schmidt, C. Becker, W. Domgraf, G. Hubner, J. Marie, John L. Twining.

Hershey Chocolate Corporation, Hershey, Pennsylvania. Booth 228. Displaying: coatings, liquors, bulk cocoas, ice cream flavors, syrups. In Attendance: H. E. Ingram, W. E. Dearden, E. F. Aldous.

Hooton Chocolate Company, 339-361 North Fifth Street, Newark 7, New Jersey. Booth 326. Displaying: quality chocolate coatings, liquors, compounds and cocoa powders. In Attendance: G. B. Dodd, E. J. Teal, Lloyd S. Fiscus, W. L. Kroc, Silvio Crespo, Roger C. Hubbard, W. Robert Schoener, Robert Hayward, Frank J. Wolf, Jr.

The Hubinger Company, 601 Main Street, Keokuk, Iowa. Booth 121. Displaying: OK brand corn syrup, OK brand confectioners' starches, OK brand Dri-Sweet corn syrup solids and product information. In Attendance: R. L. Krueger, A. M. Robinson, L. C. Watson, H. L. Bentz, G. R. Underwood, H. S. Brightman, D. L. Tiger, C. H. Lawrence, J. T. Wallenbrock, J. T. Flahiff, F. Huston Taylor, Jr., W. O. Walker, John Search, D. L. Edwards, Max Zauke, L. G. Drusendahl, Harry Reavis, J. E. Boyle.

J. A. Joffe & Co., Inc., 206 South 13th Avenue, Mt. Vernon, New York. Booth 106. Displaying: Icing flowers, sugar animals, holiday candy decorations. In Attendance: Mr. & Mrs. Roland D. Joffe, Mr. & Mrs. Daniel E. Joffe.

A. Klein & Company, Inc., 113-119 W. 17th Street, New York 11, New York. Booth 310.

Klein Chocolate Company, Brown Street, Elizabethtown, Pennsylvania. Booth 534.

H. Kohnstamm & Co., Inc., 11 East Illinois Street, Chicago 11, Illinois. Booth 221.

Lamborn & Co., Inc., 4th & Chestnut Street, Philadelphia 6, Pennsylvania. Booth 306.

J. M. Lehmann Company, Inc., 550 New York Avenue, Lyndhurst, New Jersey. Booth 231. Displaying: chocolate manufacturing machinery. In Attendance: F. Ahlfeld, C. W. Muller, J. Crifase, W. Grale, C. Dittmann, H. Mierswa.

McCarter Iron Works, Inc., Norristown, Pennsylvania. Booth 434.

The Manufacturing Confectioner, 418 North Austin Boulevard, Oak Park, Illinois. Booth 209. Displaying: The Manufacturing Confectioner, Candy Buyers' Directory, Purchasing Executives' Directory, books on confectionery manufacturing. In Attendance: Mrs. P. W. Allured, Jim Allured, Al Allured, Stanley Allured.

Marathon, Division of American Can Company, Menasha, Wisconsin. Booth 227. Displaying: new ideas in packaging for candies. Cartons and carton wraps printed by new Hi-Fi process. New combinations of materials and new coating processes. In Attendance: K. G. Houts, R. C. Clark, P. R. Rundquist, Norm Greenwood, Peter Hawkins.

Mead Packaging, Division of The Mead Corporation, 950 W. Marietta Street, N.W., Atlanta 2, Georgia. Booth 135. Displaying: Cluster-Wrap multi-unit cartons and packaging machinery. In Attendance: William C. Smith, Kenneth T. Champness, William O'Donnell, Ben Frankel, Art Hartigan, William West.

Merckens Chocolate Company, 155 Great Arrow Avenue, Buffalo, New York. Booth 407. Displaying: chocolate coatings, white coatings, rainbow coatings, chocolate liquors, cocoa powders. G. Norman Bruce, Rocky Nelson, William Merckens, Harvey Merckens, Buck Buchanan, M. O. Shuster, Otto Precht, Leo Marsullo, Maxwell Danielson, Charles LeTourneau, Gardner Beach, Jim Gray, Ted Hebden, Harry Nuss.

Merrill Lynch, Pierce, Fenner & Smith Incorporated, 70 Pine Street, New York 5, New York. Booth 130. Displaying: newswire, display board and literature. In Attendance: Malcolm Forbes, Robert Stevenson, I. Shishko, R. R. Weihe, H. W. Roberts, E. Morrison.

Mikrovaerk A/S, 32-38 Sydmarken Soborg, Copenhagen, Denmark. Booth 316, 318, 320, 417, 419. Displaying: Eriksen roller depositing plant, small size, tempering machine, chocolate pump, fully automatic Jensen moulding lines and ancillary equipment shown in illustrative material. In Attendance: Thorolf Nielsen, Karl Magnussen.

Milprint, Inc., 4200 North Holton Street, Milwaukee, Wisconsin. Booth 216-218. Displaying: carton overwraps, bags, individual wraps, bar wraps, cartons and specialized candy packages. In Attendance: William Heller, Sr., James K. Heller, James B. Perkins, Fred Iverson.

Murnane Paper Company, 1510 North Kostner Avenue, Chicago 51, Illinois. Booth 230. Displaying: assembled box and bag partitions, dividers, special board treatments, base cards, custom anti-oxidant treatments. In Attendance: F. J. Murnane, J. Hobie Murnane, Denis O. Johnson, Robert Walsh, John Murnane.

National Equipment Corporation, 153-157 Crosby Street, New York 12, New York. Booth 116, 118, 120, 122, 522, 524, 526, 528. Displaying: CM 2000 mogul, short case sealer, staggered row pump bar, 12" enrobing unit, revolving pans, tempering kettle, laboratory mixers, Rose FWT Triumph high speed kiss wrapper, Rose 5 I.S.T. twist wrapper. In Attendance: Herman Greenberg, Jack Debrovner, Alan Carter, Richard Greenberg, Sidney Greenberg, Charles Balin, Charles Greenberg, W. H. Kopp, Otto Frank, Bob Greenberg.

The Nestle Company, Inc., 100 Bloomingdale Road, White Plains, New York. Booth 200. Displaying: Nestle's, Peter's, Runkel's chocolate coatings and liquors, cocoas, and chocolate granules and Icecap couvertures. In Attendance: T. F. Corrigan, R. H. Wilson, J. E. Clarke, J. E. Conley, E. E. Ebel, J. J. Flynn, S. Katzman, J. K. McGrath, A. T. Newth, J. R. Meagher, L. J. O'Keefe, A. L. Shirley, G. A. Turner, H. S. Watts, H. B. Burrow, J. J. Scheu, R. C. Shropshire, H. J. Wolflisberg, Mrs. H. J. Britt.

New York Cocoa Exchange, Inc., 92 Beaver Street, New York 5, New York. Booth 219. Displaying: current daily Exchange quotations furnished through a cocoa ticker and direct telephone connection from the booth to the floor of the Exchange. Explanation of futures trading and the function of the Exchange in marketing of cocoa beans available from officials in attendance.

The Nulomoline Division, American Molasses Company, 120 Wall Street, New York 5, New York. Booth 220-222. Displaying: Nulomoline (standardized invert sugar), Convertit (standardized invertase), Sucrest granulated and liquid sugars, Grandma's, Rosemere light and #112 molasses, Dri-Fond (dry fondant). Sample of special summer candies. In Attendance: I. L. Cook, C. A. Bailey, A. J. Holmes, F. E. Trager, E. F. Widmayer, W. J. Notter, C. B. Broeg, F. J. Janssen, J. A. King, Martin L. Brenman, J. R. Calder, E. Park, C. E. Sampson, A. Monti, J. P. Troy.

Ray Owens & Company, 6651 North Keota Street, Chicago 46, Illinois. Booth 322.

Package Machinery Company, West Chestnut Street, East Longmeadow, Massachusetts. Booth 123, 125, 127. Displaying: automatic carton forming and candy processing equipment. In Attendance: L. A. Curtis, Harold Mosedale, E. W. Forth, J. M. Chalfant, F. L. Schrade, Ernie Hjelm, Robert Lyons, Jack Marlowe, George McIntyre, L. E. Evans, W. H. Keil, K. F. Newell, T. L. Jefferson.

Penick & Ford, Ltd., Inc., 750 Third Avenue, New York 17, New York. Booth 128. Displaying: Penford low D.E. corn syrup, Penford corn syrup, Penford Hi D.E. corn syrup, Nectose corn syrup, Veltose 165 corn syrup. In Attendance: D. P. O'Connor, O. H. Tousey, J. A. Kooreman, L. S. Poer, W. S. Russell, P. G. Wear, F. J. McCrosson, W. J. Brown, R. A. McKinley, G. R. Norton, V. Detrano, D. P. Webster.

Peters Machinery Company, 4700 Ravenswood Avenue, Chicago 40, Illinois. Booth 229.

Quincy Paper Box Company, 230 North Third Street, Quincy, Illinois. Booth 404. Displaying: Valentine heart boxes, fancy boxes, set-up paper boxes. In Attendance: Paul Jochem, M. A. Jochem.

Round Tubes & Cores Co., 806 North Peoria Street, Chicago, Illinois. Booth 131. Displaying: transparent candy canes, Easter bunnies and Valentine hearts. Also tubular dealer displays. In Attendance: Miriam Levinthal, Leon Levinthal, Harold Davis.

Savage Bros. Company, 2638 Gladys Avenue, Chicago 12, Illinois. Booth 211. Displaying: model S-48 fire mixer. In Attendance: M. A. Savage, R. J. Savage, L. K. Savage.

F. J. Schleicher Paper Box Co., 1811 Chouteau Avenue, St. Louis 3, Missouri. Booth 134.

Selected Brands Co., Inc., 1133 Broad, New York 10, New York. Booth 405. Displaying: Kremaid (20% butterfat plastic cream), "Cass" dial thermometer, "Cass" caramel stirrer, Hilliard chocolate coater, "Cass" exact weight chocolate mold filler. In Attendance: A. B. Cassidy, Sr., A. B. Cassidy, Jr., L. P. Cassidy, Allen Hilliard, Warren Steer.

Setter Bros., Inc., Cattaraugus, New York. Booth 307.

W. C. Smith & Sons, Inc., 2539 N. 9th Street, Philadelphia 33, Pennsylvania. Booth 416-418. Displaying: chocolate coater, chocolate tempering machine, power cream center former, power caramel and nougat cutter. In Attendance: W. C. Smith, Jr., R. R. Smith, S. Chas. Jacques, Les Drusedahl, Ted Merckens, Jack Green.

A. E. Staley Mfg. Co., Decatur, Illinois. Booth 224 and 226. Displaying: Sweetose converted corn syrup, Sta-Sol lecithin, Staley's confectioners' starches. In Attendance: L. S. Roehm, L. E. Doxsie, N. K. Hammer, W. D. Ray, R. L. Nagle, R. R. Dombroski, O. D. Sutter, L. H. York, G. M. Donelan, L. D. Borden, J. P. Bolas, L. G. Trempel, J. W. Robinson, J. F. Kelley, W. J. Maginn, J. H. Rolan, Jr.

Standard Brands Incorporated, 625 Madison Avenue, New York 22, New York. Booth 308. Displaying: Fleischmann's fancy pecan halves and pieces. In Attendance: Harry E. Holder, Boyce Thompson.

Stichler & Co., Inc., 108-110 South 9th Street, Reading, Pennsylvania. Booth 324.

Sugar Information, Inc., 52 Wall Street, New York 5, New York. Booth 429, 431.

Sun-Ripe Cocoanut Corp., 50 Rockefeller Plaza, New York 20, New York. Booth 425.

Supermatic Packaging Corp., 979 Lehigh Avenue, Union, New Jersey. Booth 334-336.

George H. Sweetnam, Inc., 286 Portland Street, Cambridge 41, Massachusetts. Booth 401. Displaying: confectioners' packaging papers. "Sweetone Products". In Attendance: R. A. Whittier, Jr., Paul S. Sweetnam, F. A. Sweetnam.

Swift & Company, Gelatin Department, 1215 Harrison Avenue, Kearny, New Jersey. Booth 205. Displaying: gelatin, Superwhip. In Attendance: C. W. Jensen, Dr. W. F. Collins, K. G. Loughran, R. W. Aldridge, K. W. Scott, P. J. Tiemstra, W. E. Isley, C. A. Howell.

Triumph Manufacturing Co., 3400 Spring Grove Avenue, Cincinnati 25, Ohio. Booth 409, 411.

C. E. Twombly Company, Division of Sherman Paper Products Corp., 156 Oak Street, Newton Upper Falls, Massachusetts. Booth 104. Displaying: candy cups, pads, plastic trays. In Attendance: Charles McElroy, George Duffy, William Smith.

U-Cop-Co Gelatin, United Chemical and Organic Products, Plummer Street and Wentworth Avenue, Calumet City, Illinois. Booth 330. Displaying: U-Cop-Co Gelatin. In Attendance: George W. Schmidt, Roman L. Pozorski, Joseph Manzo, Robert C. Grant, James Marconi.

Union Confectionery Machinery Co., Inc., 318 Lafayette Street, New York 12, New York. Booth 124.

Union Sales Corporation, 301 Washington Street, Columbus, Indiana. Booth 317, 319.

U. S. Cocoa Corporation, 130 North Broadway, Camden 2, New Jersey. Booth 535. Displaying: cocoa powders. In Attendance: Richard A. Brown, Norcott H. D'Esterre, Russell S. McNeil.

Voss Belting & Specialty Company, 5645 North Ravenswood, Chicago, Illinois. Booth 210. Displaying: all canvas and belting specialties for the confectionery industry featuring Satyn Gloss a super all-purpose enrober belt. In Attendance: Robert J. Voss, A. T. Stevens, Chas. Warren, James Dwyer.

T. C. Weygandt Company, 165 Duane Street, New York 13, New York. Booth 512. Displaying: Moulds, Rasch TR2 tempering machine, Rasch RPE foil wrapping machine, Hema batch roller, Steinberg spray (chocolate) system. In Attendance: Max Kaderli, Edith B. Kaderli, Ronald M. Kaderli.

I. J. White Corporation, 136-16 32nd Avenue, Flushing 54, New York. Booth 207. Displaying: Ben-Moore 500#, 300#, 100# capacity melting and tempering kettles. In Attendance: Harold J. White, James D. Leavitt.

White Stokes Company, Inc., 3615 South Jasper Place, Chicago 9, Illinois. Booth 423. Displaying: Superkreme, Whisto solids, Whistojel, Fondax, Excello, pattie fondant, cocoanut paste, vanilla, and Excello invertase. In Attendance: E. J. Stevenson, C. A. Dillon, A. N. Tzakis, J. E. Sellers, D. D. Moseley, W. W. Kearney, J. R. Giannotti, R. A. Schranz.

J. O. Whitten Co., Inc., 134 Cross Street, Winchester, Massachusetts. Booth 304. Displaying: extruded marshmallows, including flavored marshmallows and flavored-center marshmallows. In Attendance: W. I. Gorfinkle, H. O. Baker.

Wilbur Chocolate Co., Lititz, Pennsylvania. Booth 420. Displaying: chocolate coatings, chocolate liquors, cocoa products for the confectionery industry.

The Woodman Company, Inc., 647 E. College Avenue, Decatur, Georgia. Booth 532, 530.

A study of the consistency of marshmallow

by William Duck
PMCA Research Chemist
Franklin & Marshall College

A review of the food technology literature will reveal that there have been many workers concerned with finding some reliable method for measuring consistency of various foods. There have been any number of modifications of penetrometers, plungers, falling ball or falling rod type instruments designed in order that a research or

quality control man can assign some number to what people feel when they bite and chew the food. Such instrumentation has been desired because, although one can judge the consistency by simply eating a sample of the food, peoples' memories might not be good enough to note slow day by day changes. In research one might be interested in very small differences brought about by some particular experiment which may point out the direction one might go to get a more pronounced and desirable change. An instrument, if sensitive enough, can assign numbers to consistency and will serve this purpose. If these numbers relate to viscosity and elasticity then the size and shape of the molecules involved which contribute to consistency of candies can be measured. The number and degree of chemical links or attractive forces between the molecules can also be measured. If we can measure these things we are better able to control and modify them.

One instrument, the Bloom gelometer, was designed to measure the gel strength of gelatin. The results from this instrument make it possible, within limits, to grade gelatin for its most desirable quality. This same instrument has been tried for other foods including marshmallows. This instrument can only tell that a given sample reacts like other samples under exactly the same conditions. The Bloom gelometer and most other instruments mentioned can tell little or nothing about the molecular structure of the sample. Proctor (1) described an instrument which consisted of a pair of dentures actuated by a motor. When a piece of food was placed between the dentures the forces of biting were compared with the rate of movement graphically. Each type of food showed a characteristic pattern but mathematical treatment of the results is difficult.

Sterling (2) described a decay of stress technique which had been previously successfully applied to the study of the mechanical properties of rubber and plastics. He studied starch gel candies and was able to explain many of the consistency characteristics of that confection in terms of what was happening to the molecules involved and was able to make recommendations as to how this type candy might be improved.

Sterlings technique has been followed in this present study, however a simpler instrument than his has been used. This instrument is shown in fig. I and was described in a previous paper. (6) It consists of a flat steel spring anchored at one end. The sample is placed on the spring and is deformed by a plunger. The amount the spring is depressed is a measure of the stress and is indicated by a pointer on a scale.

All amorphous materials when deformed will flow at a rate depending on the elastic and viscous properties of the material. Theoretically such materials may be pictured as consisting of elastic springs and dash pots containing a viscous fluid such as the so called Maxwell model pictured in fig. II. If such a model were quickly deformed

the stress quickly increases to some high value but will then decrease at a rate related to the mathematical formula:

$$S = KE\,e^{\left[\frac{-ET}{V}\right]}$$

Where S = stress (force) exerted by the Maxwell model
E = elasticity of the spring
K = constant
e = constant. Base Naperian logarithm
t = time when stress is measured
V = viscosity of fluid in dash pot

If the stress is plotted graphically against time on a log scale for such a model as fig. II a curve such as fig. III, curve A, is obtained. It was found that plots of stress versus time for caramel using the fig. I apparatus gave such a curve as fig. III, curve A. From this one can calculate the viscosity of the flowing elements of caramel and the elasticity of the elastic elements. In the previous paper the relative effect and importance of variations of each of the various ingredients had on viscosity and elasticity was shown. The importance of controlling viscosity to control consistency was shown.

To make a similar study of marshmallow a mix consisting of 100 parts corn syrup, 115 parts cane sugar and 60 parts water was boiled to 121.5°C (250.5°F) to obtain a syrup with a total solids of 90%. This mix was then cooled to 160°F. To this was added 9 parts of 235 bloom gelatin soaked in 43 parts water. A marshmallow mix resulted with 77% total solids. This was cast into a metal cup 2 inches in diameter and 1.125 inches deep. The mix was not whipped so that the consistency effects of the mix alone could be studied without the effect of the air bubbles. The samples were allowed to gel and were stored in a constant temperature cabinet at 70°F. The gel was studied with the fig. I apparatus by quickly pressing a half inch disk onto the surface so that it sank 4.4 millimeters below the surface. The stress, reported here in arbitrary units, was measured at intervals starting at 10 seconds after deformation. Fig. III, curve B shows that a non-aerated marshmallow gel produces a straight line. When these measurements were continued for as long as 12 hours, taking care to keep the temperature constant and guarding against moisture gain or loss, the plot of values continued to be the same straight line. When a marshmallow confection which has air beaten into it is deformed and the stress plotted a curved line is formed such as curve C. The curves obtained by Sterling on starch gels were also shaped like curve C.

The shape of the caramel curve as previously discussed is due to the fact that the action of the molecules is very much like the Maxwell model. The shape of the gelatin gel curve resembles certain synthetic polymers studied by Andrews and coworkers (3) who explained such a curve as being the result of many Maxwell models with differing values of viscosity being present in the polymer. They explained that if the curves of each

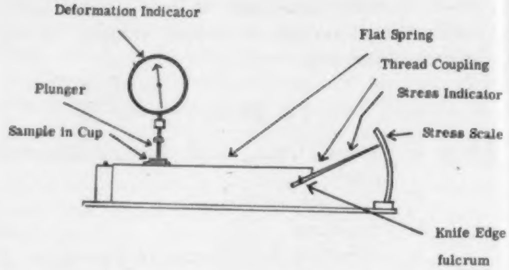
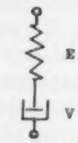


Fig. I. Diagram of the apparatus used to measure the Stress relaxation of marshmallow.

$$\text{Stress} = K\,E\,e^{\left(-\frac{Et}{V}\right)}$$



Maxwell Model

Figure II shows a Maxwell model consisting of a spring of elasticity E and a dash pot representing a viscosity V. If such a model is stretched or compressed to a constant deformation the stress S will decrease according to the mathematical relation shown. K is a constant, e is the base of the natural logarithm and t is time.

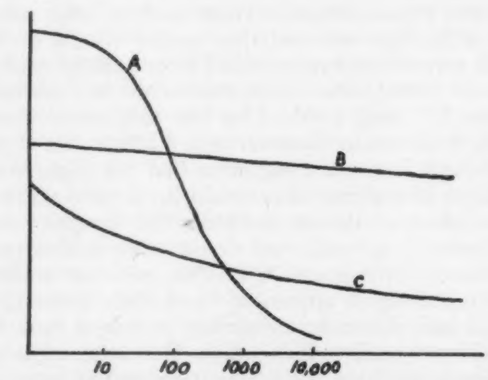


Figure III A Maxwell model will produce a curve such as A above when stress is plotted versus time as shown. Deformed caramel will also produce this shaped curve showing that caramel acts as a nearly perfect Maxwell model. Gelatin gel when deformed produces a straight line of stress versus time such as B. This is probably due to a distribution of varying Maxwell models making up gelatin gel. C is a curve produced by an aerated marshmallow confection showing the effect of air in the gel. Sterling obtained curves similar to C on starch gels. The curved shape was due to molecular bonds breaking and reforming.

of the different Maxwell models were superimposed on one another a straight line would result. This may result in turn from many differing size flowing elements or molecules present. They also showed that the time required to reach some arbitrary value of stress was related to the molecular weight of the molecules of the rubber polymer. The stress at the instant of deformation is shown by Mark and Tobalsky (4) to be directly proportional to the number of cross links of a cross linked rubber polymer. Gelatin gels are formed by the fact that the gelatin molecules which are protein

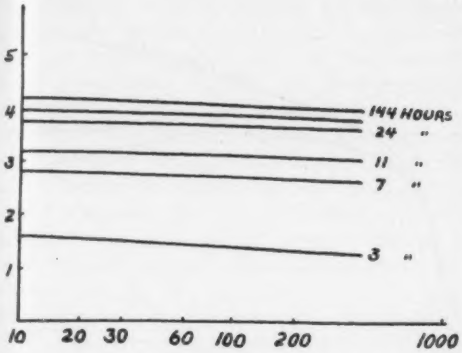


Figure IV shows the values of stress versus time in seconds obtained on deformed, unaerated marshmallow gel as the gel aged. Values of stress are arbitrary units.

polymers, are long, thin and flexible with chemical bonding points along their length (5). When gelatin jells the gelatin molecules cross-link at these points to form a three dimensional cross linked network. Clearly the structure of a gelatin gel resembles the structure of rubber polymers. Thus we can measure the amount of crosslinking and the moecular weight between crosslinks in a marshmallow gel by measuring the stress soon after deformation.

The curved plot produced by an aerated marshmallow confection is a deviation from the straight line due to the presence of air bubbles. The air bubbles are elastic bodies introduced into the gel. These are spherical shaped and it is expected that these would produce stresses out of proportion to the deformation thus causing the curved line to be produced. One can expect large air bubbles to be more easily deformed than small ones thus a measure of the contribution of the size of the air bubbles as well as the quantity of air to consistency of marshmallow should be possible.

The curved line produced from starch gels was explained by Sterling to be produced by first the breaking of and then the reformation of additional cross linking between the long starch molecules when the stress relaxation plunger deformed the gel. The gel in effect work hardened. It appears that marshmallow does not undergo this work hardening since a straight line is produced; few cross links are broken and no additional cross linking is caused by mechanical working.

When the stress relaxation was followed over a number of hours and days it was found that there was an initial rapid increase of stress measured at 10 seconds, then a slower increase over a number of days, fig. IV. This increase took place even though the gel did not lose water. Thus marshmallows can toughen on aging even though they are protected from moisture loss in a good package.

Two other samples of marshmallow mixes, one with a high percent of cane sugar and low corn syrup solids and a second sample with a high dextrose or corn sugar solids were made up. The first of these two was made up of 165 parts cane

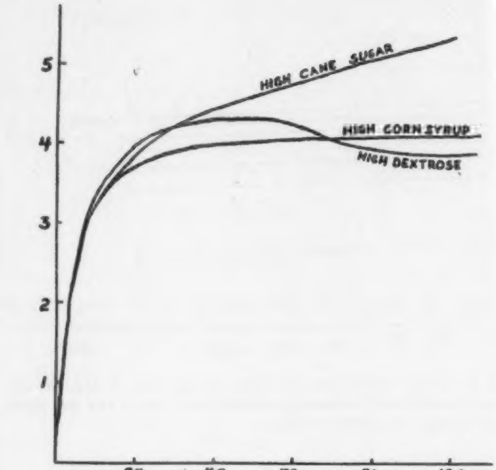


Figure V shows the change of stress measured ten seconds after deformation on three marshmallow gels as they aged. This stress, measured immediately after deformation, is proportional to the cross linking between the gelation molecules. The gel with high cane and low corn syrup or dextrose solids sets up quickly but continues to form cross links leading to toughening. Dextrose from corn syrup or added as pure dextrose did not effect the setting up process appreciable but did slow or stop the toughening process.

sugar, 50 parts corn syrup, the second using 135 parts cane, 30 parts corn sugar and 50 parts corn syrup. 9 parts of 235 bloom gelatin were used in each. The final total solids was adjusted to 77%.

When the stress measured at ten seconds was plotted over a period of 5 days for three types of marshmallow gels the results shown in fig. V were obtained. It was found that the rate of toughening was greatest with the high cane sugar gel; lower with the high corn syrup gel; initially high with the high dextrose and then lower later. Since the stress when first deformed and also at ten seconds is a measure of the cross linking which takes place when gelatin gels we can observe that the rate of cross linking increases rapidly at first then at a slower rate. The presence of dextrose clearly cuts down the toughening. With very little dextrose present this toughening increased by 30% as measured by the initial stress. This shows the value of dextrose which can be supplied by invert sugar, corn sugar or by high D. E. corn syrup as an aid to preserve tenderness in marshmallows.

Discussion

At this stage of our work which is a general survey of the possibilities of the stress relaxation technique we can show that the stress relaxation measuring apparatus will measure consistency factors of caramel, starch candies and marshmallows. The instrument is a valuable tool which can be used in future studies to show the contribution to consistency of marshmallow of such factors as bloom and viscosity of gelatin, moisture in marshmallow, swelling time of gelatin, temperature at time the gelatin is added and air bubble size.

From this present work we can see that the most important factor in marshmallow to measure

is its elasticity. Sterling pointed out that viscoelastic materials can be characterized by their relaxation time which is the ratio of the viscosity to elasticity and which is also the time required for the stress to decay to 36.8% of its original value. Perfectly elastic solids have infinitely high relaxation times and with perfect fluids the relaxation time is nearly instantaneous. The relaxation time of most materials lies between these extremes, for instance, wool and cotton have relaxation times of 10^1 and 10^5 seconds. For marshmallow, as can be seen from fig. IV, the time for a plot with an initial stress of, for instance, 6.5 to reach 2.4 or 36.8% initial stress is in the order of 10^{80} seconds. Thus we are concerned with an elastic body primarily when we are concerned with consistency of marshmallow.

The initial stress is then a measure of elastic property of marshmallow since the flow which takes place is relatively very small in a given time. This initial stress is also the measure of the cross-linking which takes place when the gelatin sets to a gel. From fig. V one can see that without the presence of dextrose there is for about 24 hours a very rapid rate of increase of stress measured when the gel is deformed which means a rapid rate of increase of cross linking of gelatin molecules. There is then a rather abrupt change to a slower rate of increase of cross linking which then continues for some days. It appears that there may be two mechanisms in gelatin gelation, a setting up mechanism and then a toughening mechanism. It would be desirable to be able to have a marshmallow set up to a definite tender consistency at the fastest possible rate to insure fast and thus low cost production. The second toughening mechanism is not desirable but is to be avoided to preserve quality. It appears that dextrose tends to control this second mechanism without much effecting the first. One would expect the aldehyde group of dextrose to have some affinity for some of the nitrogen groups of the gelatin. These nitrogen groups probably play an important part in cross linking of gelatin.

The breaking and tearing which takes place when chewing candies such as a starch jelly and marshmallow are different. These differences are shown up by the shape of the stress relaxation plots. Sterling explained the curved line to be due in part to breaking of cross links between the molecules when starch gel was deformed indicating the relative ease by which these cross links can be broken. The straight line and high relaxation time of marshmallow indicate that there is little cross link breaking or deformation. The ease of cross link breaking gives the easily broken or short character to starch gels while the strong bonds give the stretchy character of marshmallow or with excessive cross linking toughness. Thus we are able to observe and measure these two important characteristics of these candies.

As a final observation it might be pointed out that this system of testing consistency should be useful for quality control purposes in production. It has the primary value of being able to put a figure value on the most important aspects of consistency of the candies studied. A simple version such as the one used in these studies or a more elaborate one with a recorder along the lines of the one described by Sterling would assure knowing precisely the consistency from day to day production and of the product in storage. Since consistency is a quality which is sold with candy future good quality control must depend on the measurement of this quality.

References

1. Proctor, 10th Annual Production Conference, April 1956.
2. Sterling, Cereal Chemistry, page 238, July (1957), also Food Research page 233, July (1957).
3. Andrews, Hoffman, Bang and Tobalsky. J. Polymer Science 3, 669 (1948).
4. Mark and Tobalsky, Physical Chemistry of High Polymeric Systems page 330 Interscience Publishers N. Y. (1950).
5. Doty, Scientific American Page 173, Sept. (1957).
6. Duck, Manufacturing Confectioner, page 29, June 1959. 13th Annual Production Conference, Lancaster, April 1959.

the manufacturing retaile

Prestige Builds Profits

BY RAYMOND LANE, LANE-BENDER, INC.

To paraphrase President Franklin D. Roosevelt's inaugural address of 1933, I see one-third of the nation's retail candy stores ill designed, poorly merchandised, and undernourished in profits. And this is all true while the country is enjoying its greatest prosperity with a population of over 180 million people.

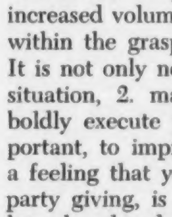
What a shame and pity that this situation has to be in existence. How needless it all is, too. Of course, it is extremely easy to blame it all on the advent of the supermarkets and either throw in the towel or go along doing business at the same stand the same way you were doing it ten or even five years ago. I would be willing to bet more than a shilling or two that if you haven't radically changed your mode of operation since 1955, your profit picture isn't a very pretty one. You may agree with me that profits aren't the best and that supermarkets are selling candy at 49¢ while you have to sell your better product at $1.49 and you may think that it would be a good idea to throw in the towel—but I have a better idea. *Change the image of your candy.* Make it look like its worth $1.49; that it is better candy than the supermarket variety; more nourishing, better ingredients, etc.

I am not suggesting change for change's sake, but, rather, I am prophesying that you must create an aura about your candy and improve your selling techniques so that you can keep your head above water. This article may not convince you to re-evaluate your store's operation, but your competitors and your sophisticated customers will definitely change your mind. If your self-analysis is too long acoming, your customers will very quickly become ex-customers.

So far I have sounded like a Dutch Uncle giving a very stern warning. Perhaps this is my role, but I am definitely not a prophet of doom and gloom. On the contrary, I feel that the opportunity for increased volume and increased profits is definitely within the grasp of practically every candy store. It is not only necessary for you to 1. analyze your situation, 2. map out a plan of action, and 3. boldly execute your plan; but also and more important, to impress Mr. and Mrs. Consumer with a feeling that your candy has taste, is elegant for party giving, is made of a finer quality of chocolate, has hundreds of delectable varieties and is very suitable as gifts and elegant for parties. These ideas will not apply entirely to all of you, no generalization is universally true. Rather, my remarks should be construed as an outline that may be of assistance to you if tailored to your own situation.

A very basic question to ask yourself is how is my store's location in regard to shifting trends in the location of people in your community? Am I still getting enough *potential* customers walking past my store every day? The type as well as the quantity of people who see your window are almost equally as important.

Speaking of windows, how's yours? Does it im-



Raymond Lane has had many years of experience in the package design field, and is a member of the Package Designers Council. He is president of Lane-Bender, Inc., which has designed award-winning packages for several candy manufacturers. Lane-Bender are members of the Associated Retail Confectioners and Mr. Lane was a principal speaker at the Mid-Winter meeting in Miami Beach this past February.

ply prestige? Is it simple, colorful and tasteful? I believe too many candy windows are cluttered up with a potpourri of merchandise. You need not show every box in the window. Too much in the window will not stop the pedestrians, but more than likely will confuse them because shoppers will pass your window in 7 seconds. How much better it would be to arrest their attention with a really elegant display piece that quickly expresses your motif, backed up by only several well chosen assortments to help create your image. Before we go into the store let's look at your sign. It should definitely convey the image of the store you are attempting to create. Your sign is an advertisement and a welcome mat, so take a good look at it, your customers do.

Now let's stroll into the store itself. Are your fixtures, cases, lights, floor, and, yes, even your ceiling modern and representative of the type of store with which you wish people to associate you? When I say modern I do not necessarily mean the antiseptic newness of Swedish design. There can be modern improvements even in Early American furniture and cases.

You should ask yourself a few questions about the people who work for you. Are they courteous sales help, or are they bumptious order takers? Perhaps even their attire can help fit into your store's image. Take a critical look at probably your most important salesmen—your packages. They should be colorful, well designed, apropos to the season or occasion, and the kind that a person would be proud to have displayed on the coffee table in his living room.

Are you using tasteful advertising? Advertisements that only appear during sales create an impression that your merchandise doesn't move and that you're trying to unload. You should work out what goals you wish to accomplish and set up a definite budget for continual advertising throughout the year. Do not overlook institutional advertisements. I don't mean the kind that show a picture of the store and tell how long you are in business. Who's interested? I mean the kind of ads that sell an image of your store and not actual boxes of candy. This type of campaign is very important for your long range program. Make sure you do a good, creative job. There are many more points that I could develop under this heading of Analysis, but neither time nor space permit any more at this moment. I suggest you prepare a check list of all the facets of your sales operation from your letterheads all the way through to your wrapping paper. Study every item and then go on to your plan of action that will help you to ameliorate the sales picture.

Throughout the section devoted to Analysis I constantly talked about the image of your store in the minds of the people in your community. To get people to buy in your store a pound box of candy for $1.49 or more, instead of paying only 49¢ or less in a supermarket, is not an easy problem. Every phase of your operation should be devoted to making your customers feel that to

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FACTORIES: LOS ANGELES
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buy a box of your candy either for personal consumption or as a present is an inexpensive way to partake in the good things in life. Over and over again you must convey the message that your candy is delicious, that only the finest ingredients are used, and that this type of candy just cannot be purchased in any other type of outlet. Not only should a consumer walk out with a box of candy, but he must also walk out with the feeling that he is partaking in our luxurious age of elegance. On Madison Avenue the admen sum it up by saying, "Sell the sizzle, not the steak." *You* must sell the aura of quality not a cherry filling.

To stay profitably in business you must plan on selling this image in all your aspects of operation. Make sure you touch every base when making up this plan. Halfway measures will only be throwing out your money.

You are a candy man, and probably a darn good one, too. But this does not make you an expert in package design, advertising, store layout or the other phases of your operation that I have mentioned. I suggest you call in some experts to advise you and perform these functions for you. These aides should be called in to assist you as far back as analysing. You will find that they will think of details to improve that you never realized needed improvement. These specialists are not as close to your forest and can readily see the trees that escape your scrutiny. They will help you in your planning stage, and, of course, in *executing the plan.*

I am sure that if you *Analyze, Plan,* and *Execute* thoroughly and imaginatively, and that if you utilize the professional services that are available, you will be able to meet and overcome the problems that are caused by supermarkets. You may not agree, but I am glad that the supermarkets are here and are able to provide you with competition. After all, it is really competition that is the back bone of our free, capitalistic society. We improve because our competition forces us to.

Although supermarkets are dynamic and popular they are by no means infallible. Look for the chinks in their armor. Why is it that in the last few years there has been a return to small supermarkets called superettes in Manhattan? Why are half the food products still sold in independent and ma and pa stores? The answer is service. This service can be in the form of credit, deliveries, or clerks. You are comparatively lucky. You need not offer credit or delivery service. What you could and should offer is good sales help and a special bonus with every purchase. The best part of it all is that this bonus costs you nothing at all. If it is free what can it be? It is simply the feeling on the part of each customer as he walks out of your store that he just bought a quality item from a fine store. And it didn't cost him an arm and a leg. This customer will be back. All you have to do is attract his attention and make him feel that he is welcome.

Mister Retailer—it is all up to you and your image.

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LENN LIBBY'S BANGOR TAFFY

BY GEORGE WHITE, Candy Maker

Formula:

7 lbs. glucose
8 lbs. sugar
2 qts. medium fresh cream
8 cans evaporated milk
3 oz. salt
4 oz. pure vanilla
1 lb. fresh creamery butter

Procedure:

Cook glucose, sugar and fresh cream, stirring until it thickens. When thick, add evaporated milk. Stir again until thick, then reduce heat and cook slowly until a ball forms in cold water . . . . about 45 minutes.

While the batch is still on the fire add one pound of fresh creamery butter, cut up. Remove from heat and add salt and vanilla. Pour on slab or cold water cooling table, spread to ⅜″ thick, and leave for about 15 minutes. Cut into 3/8 inch squares and, finally, roll these in powdered XXXX sugar.

This item was years ago made exclusively for sale on the train between Bangor and Portland, Maine.

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One (1) Savage revolving can mixer and can for caramel corn. One (1) gas commercial dry pop corn popper. King Candy Company, P. O. Box 2080, Fort Worth 1, Texas.

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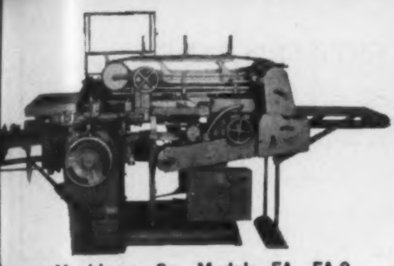

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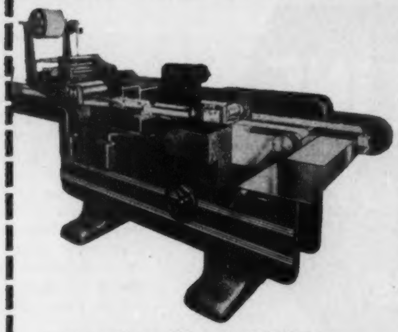

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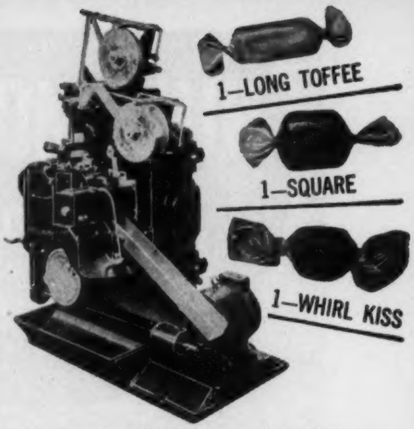

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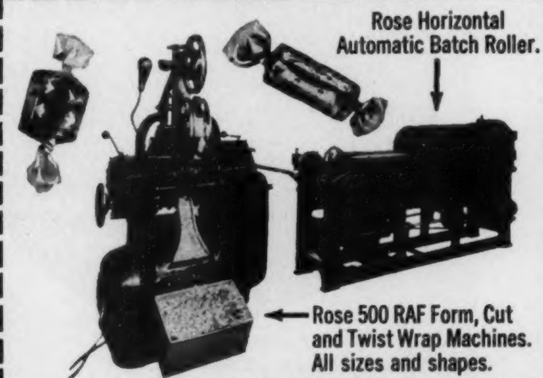

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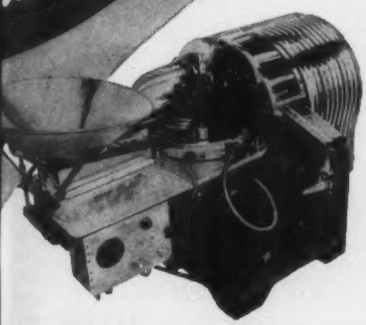

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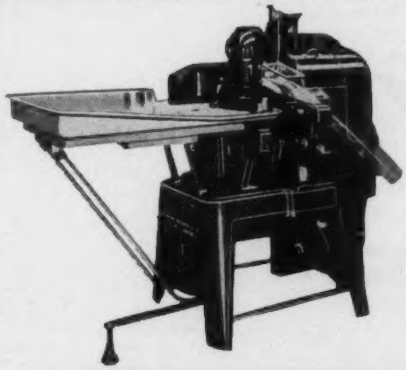

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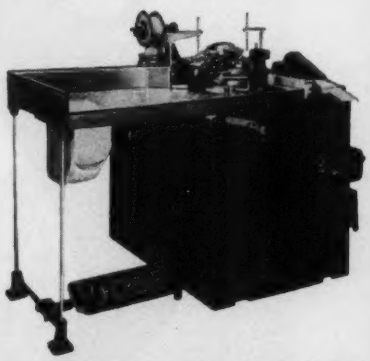

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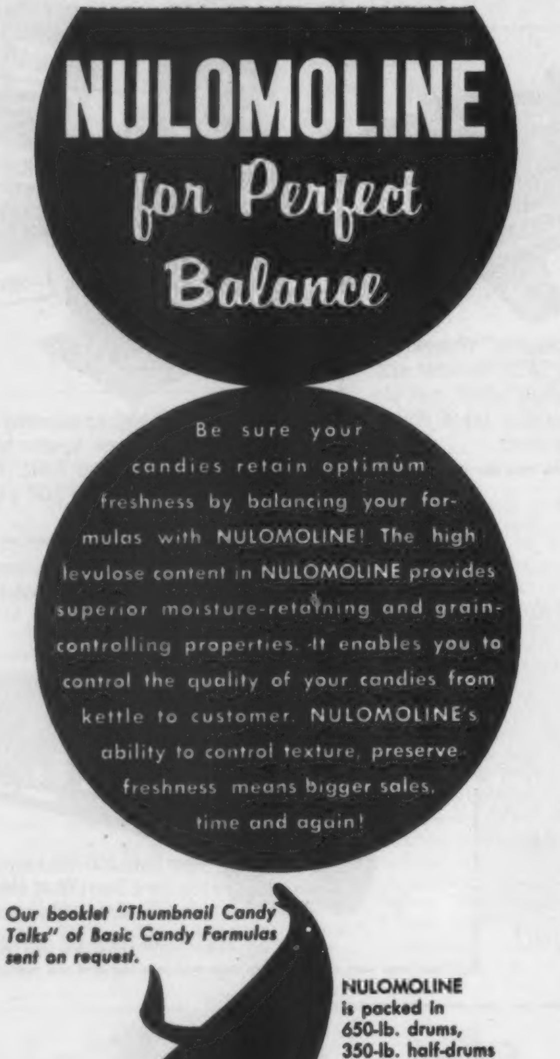

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